

# Essays on Incentives and Chinese Economic Reform

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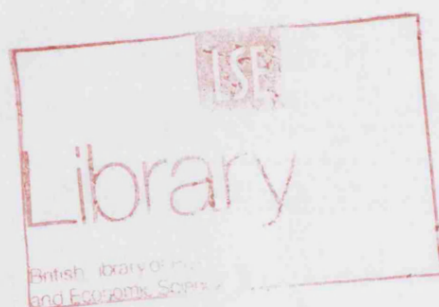
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# Abstract

This dissertation consists of three essays on incentives and Chinese economic reform.

In the first essay, I collect a unique dataset of Chinese municipalities from 1978 to 2007 to evaluate the impact of a Special Economic Zone experiment with incentives including property rights protection, tax breaks and a preferential land policy for foreign investors. Guided by a theoretical model, I find the SEZ policy: 1) increases per capita foreign direct investment by 58%; 2) does not crowd out domestic investment and 3) increases TFP growth rate by 0.6 percentage points. The results suggest that SEZs not only bring capital, but also more advanced technology.

In the second essay, I evaluate the fiscal incentive - the marginal sharing rate of fiscal revenue faced by Chinese provincial governments. In 1994, China engaged in a fiscal reform which set marginal sharing rates of budgetary taxes across provinces to a uniform level. Exploiting heterogeneity in the pre-reform budgetary sharing rate, I find that provinces with lower pre-existing rates collect more budgetary taxes; at the same time less extra-budgetary revenue after 1994 relative to those with higher starting level. The results suggest that Chinese provincial governments treat the budgetary tax and extra-budgetary revenue as substitutes.

The third essay studies the impact of Chinese municipal governments' fiscal sharing rate on the local economy. The fiscal regime change in 2002 largely reduced the local sharing rate of enterprise income tax. I find that municipal governments respond to this change by allocating more resources including land and capital into the real estate sector, leading to social conflicts between local governments and farmers whose lands were taken with low compensation. The results imply that regional decentralization has to be matched with well-designed incentives to benefit the majority of the population within the jurisdictions.

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# Preface

Capital shortage, low skilled production technology and passive governments are among the issues which prevent developing countries from growing as the neoclassical model has predicted. As such, these problems are of intrinsic economic interest. By improving our understanding of these issues, we can better structure policy to help alleviate these traps. Methodologically, I exploit Chinese economic reforms since 1979, which constitutes a unique laboratory for studying development policies aimed at tackling the problems above. Despite the fact that my thesis uses Chinese data, the mechanisms implied from Chinese reforms, for example, how foreign investors respond to the incentive package embedded in Special Economic Zone experiment, how local governments react to fiscal incentive, viz. the marginal sharing rate of fiscal revenue, are not only applied to China, but also have wide applications in many other countries. The three chapters are laid out along similar lines: each of them looks at behavior relating to incentives. A theoretical framework is presented, from which predictions are extracted. The predictions are subjected to empirical analysis afterwards.

Capital as well as advanced technology is typically desirable for development. Many nations around the world have established Special Economic Zones, which are contained geographic regions within countries and are typically characterized by liberal laws and economic policies, to attract foreign capital, boost exports and absorb advanced technology. However, there are no empirical studies on the SEZs using systematic statistical evidence. In the first chapter, I fill the gap by exploiting the gradual establishment of SEZs across Chinese municipalities to make contributions to our understanding of the impact of SEZs on foreign direct investment and technology progress.

First, I develop a simple model mapping the foreign investor location decision to the municipal macroeconomic outcome. Then, I use this model to assess empirically the importance of the Special Economic Zone experiment for productivity. Exploiting the gradual expansion of SEZs in Chinese municipalities, I find that SEZs with incentives including property rights protection, tax breaks and a preferential land policy for foreign investors not only bring capital, but also boost total factor productivity growth.

Extensive work has examined how to design contracts with effective incentives to motivate firms and individuals. However, the channel of public organizations responding to incentives, thus how to motivate governments, is understudied empirically. We often read in various publications that local governments in developing countries are not as accountable and efficient as they ideally should be. The second chapter then aims to examine the fiscal compensation scheme between China's sub-national governments and national government. It evaluates the effects of fiscal incentives on provincial government's fiscal effort and sheds light on how government agencies react to incentives under a multi-tasking framework. Contract theory predicts that in

general, if the agent faces two tasks, the optimal effort on each task will depend on the sharing rates of both tasks. Changing one task's marginal sharing rate will cause changes to the productivity of both tasks.

From 1980 to 1993, China implemented a fiscal contracting regime. Provincial governments signed fiscal contracts with national government, in which they agreed on a local marginal sharing rate. Marginal sharing rates on budgetary revenue during this period exhibited cross-province variations. In addition to budgetary revenue, there is an extra-budgetary revenue that they have been allowed to set aside since the early 1980s and on which they enjoy a 100% sharing rate. In 1994, China's national government engaged in one of the largest fiscal reforms on record that set marginal sharing rates of budgetary taxes across provinces to a uniform level.

My identification strategy combines the introduction of this reform with the cross-province differences in pre-reform marginal sharing rates. After the reform, I find that on one hand, in the budgetary category, business tax revenue, enterprise income tax revenue and value added tax revenue increased more in provinces that previously had lower marginal sharing rates relative to those that had higher rates. On the other hand, in the extra-budgetary revenue category, provinces with lower pre-1994 budgetary sharing rates devote less effort to extra-budgetary revenue collection after the reform, relative to provinces with higher pre-1994 marginal sharing rates. The results suggest that local governments treat the budgetary tax revenue and extra-budgetary revenue as substitutes. The policy implications drawn from the findings would be to provide local governments with a higher fiscal sharing rate will help enhance their effort.

In Chapter 2, I evaluate the effect of the intergovernmental revenue sharing rate on provincial government's fiscal effort and shed light on how government agencies react to incentives under a multi-tasking framework. Despite the fact that various categories of fiscal revenue are used as the ultimate outcomes to capture fiscal effort, I can not explore the exact channels of such efforts due to data constraints. The change in fiscal revenue might come from the local governments' effort at better enforcement or through boosting fiscal revenue base, and the third chapter attempts to disentangle these channels. In Chapter 3, I move one level below and investigate how municipal governments react to the powerful fiscal incentive change in terms of their economic development strategy. In contrast to the previous chapter, I can explicitly pin down the mechanisms by which local governments influence regional economy. Guided by the analytical framework from a multi-tasking agent model, I test the impact of the exogenous fiscal regime change in 2002 that greatly reduced the local sharing rate of enterprise income tax on municipal governments. I find supporting evidence that municipal governments respond to a reduced local sharing rate of enterprise income tax by allocating more resources, especially land, from agriculture into the real estate sector. On one hand, by switching their development focus to urbanization as articulated in the recent real estate boom, local governments benefit greatly from fiscal

categories including business tax revenue and land sale extra-budgetary revenue. On the other hand, the huge amount of land conversion and escalating real estate price causes worsening social conflicts between local governments and the general public including farmers whose lands were taken with low compensation and residents who are unable to afford the housing price.

The findings suggest that regional decentralization should be matched with well-designed incentives for local governments and property rights for disadvantaged groups such as farmers. After all, the aim of decentralization is not just about motivating local governments to promote overall GDP growth or fiscal revenue, but essentially about making local governance more responsive to local needs and bringing the utmost benefits to the large majority of the local population.

# 1 The Economic Impact of Special Economic Zones: Evidence from Chinese Municipalities

## 1.1 Introduction

Special Economic Zones (SEZs) are contained geographic regions within countries - a demarcated area of land used to encourage industry, manufacturing, and services for export, and are typically characterized by more liberal laws and economic policies than a country's general economic laws<sup>1</sup>. Since 1979, China has gradually created SEZs in its municipalities with property rights protection, tax breaks and a preferential land policy specifically for foreign investors. This SEZ experiment has transformed China into one of the largest FDI recipients, exporters and foreign exchange reserve holders in the world<sup>2</sup>. Figure 1.1 displays the significant correlation between the SEZ experiment and FDI outcome in China.

China is a prominent member in the group of countries which have experimented with the SEZs, and many other nations being from Asia to Latin America, Europe and Africa have turned to SEZs to attract foreign capital, boost exports, create jobs, stimulate industry and improve upon existing infrastructure. According to the World Bank's latest report on SEZs released in 2008, "by some estimates, there are approximately 3,000 zones in 135 countries today, accounting for over 68 million direct jobs and over \$500 billion of direct trade-related value added within zones." Despite the fact that the SEZs have extensively influenced many countries, to my knowledge, there are no empirical studies on the SEZs using systematic statistical evidence.

In this paper, I exploit the establishment of SEZs in China since 1979, which constitutes a unique laboratory for the study of SEZs, to make three contributions to our understanding of the impact of SEZs on foreign direct investment and other outcomes. To do so, I collected a comprehensive new dataset on Chinese municipalities at which level the Special Economic Zone experiments were carried out. First, I estimate the effectiveness of Special Economic Zones on attracting foreign direct investment, mainly in the form of foreign-invested and export-oriented industrial enterprises. Second, I estimate the effect of Special Economic Zone policy on the domestic investment and capital stock of the municipality. Finally, in addition to physical capital, I also check whether the Special Economic Zone brings more advanced technology, i.e. higher total

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<sup>1</sup>Refer to Semil Shah (2008).

<sup>2</sup>According to Prasad and Wei (2006), over the past decade, China has accounted for about one-third of gross FDI flows to all emerging markets and about 60 percent of these flows to Asian emerging markets. Even excluding flows from Hong Kong to China from these calculations (on the extreme assumption that all of these flows represent "round-tripping" of funds originating in China), China's share in these flows is still around 20% of all emerging markets and 50% of those flows to Asian emerging markets.

factor productivity growth.

The Chinese central government did not compile detailed information on the year and location of the creation of the SEZs until 2006. In 2008, in order to celebrate the 30th anniversary of "Open Door" reform<sup>3</sup>, China published brand new economic statistics on municipalities, mainly growth-accounting data. This is the first time that China prepared comprehensive statistics at the municipal level covering main economic indicators between 1978 and 2007. Based on these sources, I construct a new dataset for 326 Chinese municipalities<sup>4</sup> containing information on GDP, investment, employment, foreign direct investment, exports as well as a digital GIS map of Chinese municipalities which is coded with the year the SEZ is created. This dataset allows me to track the evolution of China's municipal economies before, during and after the expansion of Special Economic Zones. Information on municipal GDP, investment and employment are particularly important, because they enable me to identify the channel through which municipalities gain from the expansion of Special Economic Zones (as I describe explicitly below).

To guide my empirical analysis, I develop a simple model mapping the foreign investor location decision to the municipal macroeconomic outcome. I use this model to assess empirically the importance of the Special Economic Zone experiment for productivity, since having FDI increases not only capital stock but also total factor productivity growth (i.e. technology<sup>5</sup>). The conceptual framework generates three hypotheses that drive my three step empirical analysis:

1. Special Economic Zones, by combining private property rights protection, tax break and preferential long-term land use fee, attract foreign direct investment;
2. Special Economic Zones, depending on possible crowding-out and crowding-in effects of FDI, may or may not change domestically owned capital formation;
3. Special Economic Zones, if bringing more advanced FDI, will boost the municipal technology progress, i.e. total factor productivity growth.

Because China gradually expanded the Special Economic Zone experiment to its municipalities, I am able to identify the effect by exploring cross time within-municipality and cross municipality within-year variations. Despite the fact that almost all Chinese municipalities (300 out of 326 in my sample) carried out Special Economic Zone experiments by the end of 2007, there are still big concerns about potential endogeneity of the Special Economic Zone granting sequence and the validity of its estimated effects. Therefore, I use three strategies to mitigate this concern. First, I add municipality specific trend to control for unobserved changes in the local economic

<sup>3</sup>Basically, Open Door reform means liberalization.

<sup>4</sup>My dataset includes 326 out of 333 municipalities in China. Details are given in the data appendix.

<sup>5</sup>An ideal variable to measure municipal technology is patents. However, there is no well kept statistics on municipality level patents from 1978 to 2007. Therefore, I use TFP as a proxy.



environment which might be correlated with the timing of SEZ establishment. Second, the potential endogeneity of the timing of SEZ establishment might make the municipalities that carried out the SEZ experiment later an unsuitable comparison group to those granted the SEZs earlier and consequently cast doubt on the validity of the estimated effects. I collected data on geographical location, industrial condition and human capital, based on which the State-council of China granted Special Economic Zones to municipalities in earlier years. This allows me to match municipalities which experimented with SEZs earlier to municipalities which experimented with SEZs later that are comparable in these indicators considered relevant for the outcomes under analysis. In this matching exercise each municipality which had SEZs in earlier years is matched with its closest counterpart which had SEZs in later years along these three dimensions. This approach implies that I am comparing early treated municipalities to late treated municipalities that are similar in terms of these three indicators before the Special Economic Zone experiment was carried out in China. Third, to prevent the results from being largely driven by the municipalities which had SEZs in earlier years and potentially had the most serious selection problem, I also examine the estimates restricting my sample to those municipalities which had SEZs in later years.

Moreover, there are concerns that foreign firms anticipate the SEZ establishment and thus delay their investment projects to coincide with the opening of the SEZ. I therefore run a placebo test and find that there was no hike or dip before the SEZ experiment took place and that the increase in FDI related outcome started only after the experiment. As a result, there is no anticipation of SEZs by foreign firms, encouraging the interpretation that SEZs have attracted FDI, increased exports and industrial output by foreign invested enterprises. Furthermore, we might worry that the foreign direct investment SEZs attract might not only come from creation effect, but also from diversion effect. Thus, I run empirical exercise to separately identify those two effects. The results indicate the co-existence of sizable creation effect and partial diversion effect by the Chinese SEZ experiment.

This paper contributes to the literature on Special Economic Zones<sup>6</sup>, as well as a large literature on estimating the economic impacts of foreign direct investment<sup>7</sup>. My work to empirically examine the Special Economic Zone experiment under a cross-

<sup>6</sup> According to Aradhna Aggarwal, Mombert Hoppe and Peter Walkenhorst (World Bank), current work on SEZs are mainly case studies including Willmore (1996) on Export Processing in the Caribbean; Kung (1985), Ge (1999) and Park (1997) on detailed descriptions of SEZ policy in China; Rolfe et. al. (2004) on incentives of Kenyan Special Economic Zone; Aggarwal (2005) on Comparative Analysis of Special Economic Zone performance in India, Sri Lanka, and Bangladesh, etc.

Litwack and Qian (1998) develop a theory for a transition economy (China) under which an unbalanced development strategy favors special economic zones.

<sup>7</sup> Some papers view the benefit of FDI as important source of capital stock using country level data, such as Whalley and Xin (2006), McGrattan and Prescott (2009), Desai, Foley and Hines Jr. (2009); other work focused on FDI as important sources of technology spillover, for example, Coe, Helpman and Hoffmaister (2009) use cross-country data to estimate the impact of domestic and foreign R&D capital stocks on TFP; Liu (2008) used a large panel of Chinese manufacturing firms to the effect of FDI on domestic firm TFP. Hale and Long (2007) using a firm-level data set on China, fail to find evidence of systematic positive productivity spillovers from FDI.

municipality framework is an important complement for current research on Special Economic Zone performance which are mainly case and theoretical studies<sup>8</sup>. My paper evaluates the impact of FDI brought by the SEZs at the municipal level and so builds a bridge between country level and firm level studies. Empirical work using cross country data have suffered from an omitted variable problem since different countries are characterized by very different institutional and cultural features, which may well correlate with foreign direct investment. Meanwhile, research using firm level data could provide cleaner estimates under a stronger identification strategy and pin down accurately how foreign multinational firms interact with domestic firms. However, these studies can say little about macro-level impact of foreign direct investment on the domestic economy. Because this paper uses the variation within Chinese municipalities, many of the institutional, cultural, and policy variables that confound the relationship between the Special Economic Zone experiment and macroeconomic outcomes at the country level are held constant, which increases the inferential validity. Another advantage of my study is that I can say more about the channels of causation from a macroeconomic perspective. In particular, I can distinguish between the effects of the Special Economic Zone experiment operating through increasing foreign owned capital in the municipality, and those operating through boosting total factor productivity growth.

There are of course disadvantages regarding my estimates on the Special Economic Zone experiment. China's Special Economic Zone experiment is a combination of private property rights protection, tax breaks and a preferential land policy for foreign investors. It is therefore difficult separately to identify the elasticity of foreign direct investment with respect to private property rights protection, tax reduction and land use fee discount<sup>9</sup>.

The next section introduces the historical background of China's Special Economic Zone experiment and provides a brief description on my dataset. Section 1.3 presents a simple model mapping the foreign investor location decision to municipal macroeconomic outcomes which generates three predictions for empirical testing. Section 1.4 estimates the direct impact of Special Economic Zones on foreign direct investment related outcomes. Section 1.5 estimates the effect of the Special Economic Zone experiment on the composition of municipal investments, therefore the impact on the physical capital stock. Section 1.6 calculates the effect of Special Economic Zones on total factor productivity growth. Section 1.7 concludes.

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<sup>8</sup>The only exception is Wei (1995). He has exploited Chinese city level data from 1980-1990 to examine a reduced-form relationship between the open-door (SEZ) policy proxied by FDI and exports, and Chinese growth. However, his dataset does not report investment, which prevents his study from exploiting a complete growth accounting framework.

<sup>9</sup>Du et. al. (2009) examines the impact of economic institutions, including property rights protection and contract enforcement, on the location choice of foreign direct investment from a data set of 6,288 U.S. multinationals investing in various China's regions; Devereux and Maffini (2006) summarized the empirical literature on the impact of taxation on the location of FDI.

## 1.2 Background and Data

In this section I discuss some essential features of the Special Economic Zone experiment and the data that I have collected in order to analyze how the municipal economy changed with the SEZs.

### 1.2.1 Special Economic Zone Experiment Review

China's administrative system has five hierarchical levels of government: (1) central; (2) provincial; (3) municipal; (4) county; and (5) township. In this paper, I focus on the municipal level where the Special Economic Zone experiment has been carried out.

In the late 1970s, approval was given by the State Council for small-scale SEZ experiments in four remote southern cities, including Shen Zhen, Zhuhai and Shantou in Guangdong Province, as well as Xiamen in Fujian Province. Importantly, given the fact that China started with virtually zero foreign direct investment and almost negligible trade before 1978, these zones were used as a "test base" for liberalization of trade, tax and other policies that were then gradually applied to the rest of the economy. In August 1980 the People's Congress passed the first legal rule on the SEZs: "the Regulation for Guangdong SEZs." This regional law was the first of its kind to be tested, which was drafted with the help of legal experts sent from the central government (Cai et al., 2008). When the experiment was expanded into other provinces, they also adopted and modified this law accordingly<sup>10</sup>. The law of SEZs explicitly provides the following policy packages for foreign investors:

1) Private Property Rights Protection<sup>11</sup>: the SEZs encourage foreign citizens, overseas Chinese, compatriots from Hong Kong and Macao and their companies and enterprises (hereinafter referred to as "investors") to open factories and set up enterprises and other establishments with their own investment or in joint ventures with Chinese. The SEZs guarantee to protect their assets, accruing profits and other rights in accordance with the law. This is a very important commitment by the Chinese government since there was no constitutional protection of private property rights outside SEZs until recently (the 2004 constitutional amendment).

2) Tax incentives: foreign investors can enjoy a reduced rate (15-24%) of corporate income tax compared to 33% paid by domestic firms. They bear virtually zero custom duties and can enjoy duty free allowances for production materials. There are income tax exemptions for foreigners working in SEZs as well<sup>12</sup>;

<sup>10</sup>The Central Government Circular No.50, 1979, Zhongfa (1979) 50. The details of the political decision making process are comprehensively summarized in Xu (2009).

<sup>11</sup>Besley (1995), Besley and Ghatak (2010): "Property insecurity acts much like a random tax on land, and thus reduct invest incentive".

<sup>12</sup>World Bank (2008): "There has been a great deal of debate regarding the types of fiscal incentives and other privileges at the heart of an SEZ regime. Countries are under pressure to offer a generous package of tax and duty exemptions in order to keep pace with their competitors. The package of fiscal incentives has become almost standardized among zones internationally—corporate tax reductions

3) Land use policy<sup>13</sup>: under Chinese law, all land is under state ownership. Foreign investors may lawfully obtain the rights for land development, use and business. They may also transfer and lease land rights, or put them up for mortgage in accordance with the law within the stipulated purposes and terms of the use. When foreigners invest in projects encouraged by the State for an operation term of more than 15 years, the construction land is exempt from land use fees for five years starting from the day when the enterprise obtains the use right, and the fee is collected at half price in the following five years. The land use right is guaranteed for projects that have a total investment of US \$10 million, or that are technologically advanced and have a major influence on the local economic development despite total investment being below US \$10 million.

4) Liberal economic and labor laws: there are limited restrictions on foreign ownership. Foreign invested firms have the power to hire and fire their employees.

The government made clear the targets of Special Economic Zones described by 4 principles: *"Construction primarily relies on attracting and utilizing foreign capital; primary economic forms are Sino-foreign joint ventures and partnerships as well as wholly foreign-owned enterprises; products are primarily export-oriented; economic activities are primarily driven by market forces"*.

Supported by the initial achievements of the first group of SEZs, in 1984, the central government expanded the SEZ experiment to 14 other coastal cities to foreign investment<sup>14</sup>. From 1985 to 1988, the central government further included more municipalities along the coastal area into the SEZ experiment<sup>15</sup>. In 1990, the Chinese government decided to open the Pudong New Zone in Shanghai to foreign investment, as well as more cities in the Yangtze River Valley. The pattern of granting SEZ status in earlier years is not purely random, according to state-council documents (1980-1990)<sup>16</sup>, the central government chose municipalities to be granted with the Special Economic Zones based on better geographical location, industrial condition and human capital.<sup>17</sup> From 1992 to 1994, the State Council opened a number of border cities and all the capital cities of inland provinces and autonomous regions. In addition, 222 state-level economic zones and 1346 province-level economic zones<sup>18</sup> were gradually established within the municipalities to provide better infrastructure and achieve ag-

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or exemption; duty-free importation of raw material, capital goods, and intermediate inputs; no restrictions or taxes on capital and profits repatriation; exemption from foreign exchange controls (where applicable); no charges on exports; exemption from most local and indirect taxes; and so on."

<sup>13</sup>Source: the government website of Zhejiang province.

<sup>14</sup>Listed north to south: Dalian, Qinhuangdao, Tianjin, Yantai, Qingdao, Lianyungang, Nantong, Shanghai, Ningbo, Wenzhou, Fuzhou, Guangzhou, Zhanjiang, and Beihai.

<sup>15</sup>Listed north to south: Liaodong Peninsula, Hebei Province (which surrounds Beijing and Tianjin), Shandong Peninsula, Yangtze River Delta, Xiamen-Zhangzhou-Quanzhou Triangle in southern Fujian Province, Pearl River Delta, and Guangxi.

<sup>16</sup>Refer to various State Council documents issued in 1984,1985,1987,1988,1991,1992,1993 for details.

<sup>17</sup>China's development strategy based on location is discussed in Démurger al. etc (2002).

<sup>18</sup>State-level SEZs are granted by the central government; province-level SEZs are granted by provincial governments.

glomeration of foreign investors. As a result, a multilevel diversified pattern of opening and integrating coastal areas with river, border, and inland areas has been formed in China. China's Special Economic Zone experiment is described by the World Bank as a unique Zones within Zone case because large opened economic zones (municipalities) hosted small economic zones (state-level and province-level economic zones) within each municipality's territory. Figure 1.2 displays the geographic evolution of the Special Economic Zone experiment.

In Table 1.1, I summarize the four big waves in the SEZs experiment, i.e. 1979-1985, 1986-1990, 1991-1995, 1996-2007. The ratio of municipalities with SEZs starts from 0% in 1978, to 9% in 1985, 24% in 1990, 69% in 1995 and 92% in 2007. The SEZ experiment was expanded from coastal areas, beginning with municipalities with average distance to the coast of 15 miles, and expanding to those municipalities with an average distance of 626 miles to the nearest coast. Also, the SEZs were experimented using more industrial developed areas first, measured by higher average initial industrial output, and later expanded to less industrial developed areas. However, there are no significant statistical differences in human capital across the four groups of municipalities which were granted the SEZs at different times.

### 1.2.2 Dataset on Chinese Municipalities

In order to evaluate the impact of Special Economic Zones, I constructed a new panel dataset on 326 Chinese municipalities. The dataset tracks Chinese municipalities on GDP, investment, employment, foreign direct investment and exports as well as a digital GIS map of Chinese municipalities which is coded with its year of opening up and the SEZ establishment. Table 1.2 displays descriptive statistics for the variables that I use in this paper. The Data Appendix contains more details on the construction of these variables.

**Special Economic Zone Index** In the dataset, I have detailed information which captures features of the SEZ experiment:

1. Lists of coastal and inland municipalities which were granted an open special economic area and the timing of granting;
2. Lists of state-level economic and technological development zones/ new and high-technology industrial development zones/ Export Processing Zones/ Border Economic Cooperative Zones within municipalities, the size of these zones within the municipality and the timing of granted establishment;
3. Lists of provincial economic and technological development zones/ new and high-technology industrial development zones, the size of these zones within the municipality and the timing of granted establishment.

Being granted the status of open special economic area means the whole area of the municipality is a large SEZ for foreign investors. Being granted the status of state-level or province-level economic zones means that within the municipality, certain geographical area is used as SEZs to host foreign investors. In the full sample, some municipalities were granted the status of open special economic areas as well as allowed to establish state-level and province-level economic zones within a certain geographical area inside the municipality in later years, i.e. a large SEZ can contain multiple "specific" zones within its boundaries. For example, some coastal municipalities such as Shenzhen, Shanghai, Dalian, Tianjin and Guangzhou were allowed to construct more and larger zones within the municipality from the central government after they as a whole were granted the status of open economic areas. Most inland municipalities as a whole were not granted the status of open economic area. They just have relatively smaller and less economic zones constructed within its city area granted from higher level governments. Therefore, the intensity of the SEZ experiment differs across municipalities and years. If I use three variables including an opening economic area dummy, accumulated size of state-level economic zones and accumulated size of province-level economic zones fully to explore the intensity of the SEZ treatment, the identification strategy is vulnerable to endogeneity problem, since the fact that coastal municipalities were granted with more and larger SEZs is highly correlated with their potential in attracting foreign direct investment. In order to alleviate the non-randomness regarding the treatment intensity and provide a much cleaner identification, I instead use a general SEZ dummy<sup>19</sup>,

$SEZdummy = 1$ , if the municipality as a whole is granted the status of open economic zone area, or a municipality is allowed to establish a state-level economic zone in a certain geographical area within the municipality, or the municipality is permitted to establish a province-level economic zone in a certain geographical area within the municipality;

$SEZdummy = 0$ , if otherwise.

Despite various types and different names for SEZs, I checked the SEZ law for open special economic area, state-level SEZs and province-level SEZs respectively. There are no systematic policy differences regarding property rights protection, tax breaks or land use policy, which justify the validity of using a general SEZ dummy to capture this experiment.

**Foreign Direct Investment** Data at the municipal level including utilized foreign direct investment, exports and industrial output by foreign invested enterprises are used to capture the direct outcome from the Special Economic Zone experiment.

Figure 1.3 plots the sample mean of the log of per capita foreign direct investment

<sup>19</sup>To exploit more variation in the intensity of special economic zone reform, I run regressions on three variables, i.e. open economic zone area dummy, land area of state-level economic zone, land area of province-level economic zones as supplemental evidence. The results are consistent with using single treatment variable, i.e. SEZdummy.

by year for four groups of municipalities classified based on the timing of the SEZ experiment. It reveals that the SEZ experiment boosts FDI significantly for every group. We observe FDI increasing significantly after each group of municipalities was granted the SEZ status. However, the effect seems to be much stronger for the municipalities which carried out the SEZ experiment earlier. To prevent biased estimates due to the potential selection problem, I use more rigorous methods in the main specification.

**Growth Accounting Data** The credibility of statistical data published by China's statistical office is under scrutiny in various studies (Young, 2003; Holz, 2008). Having acknowledged the potential bias, apart from annual revisions to the national income and product accounts data first published in the previous year, China's National Bureau of Statistics has so far conducted two benchmark revisions. The first occurred following the 1993 tertiary (service) sector census with adjustments to 1978-93 tertiary sector value added and, by implication, to the sum of sectoral value added, i.e., gross domestic product (GDP). The second benchmark revision occurred in early 2006, following the 2004 economic census of the secondary sector (industry, construction) and of the tertiary sector using the OECD method. My dataset is based on the latest municipal statistics after these adjustments. Following Caselli (2005) and Young (2003), I have constructed Real GDP, Real Capital Stock, human capital augmented labor and share of labor income.

### 1.3 A Conceptual Framework

#### Foreign Investor Location Decision:

In the context of the Special Economic Zone experiment in China, we need to consider the essential elements foreign investors took into account when they made the location decision. China's National Development and Reform Commission (2007) carried out a survey regarding potential policy changes that most worried foreign enterprises. The results suggest that the incentive package the Special Economic Zone experiment provided, including tax incentives and favorable land policy, were among the key determinants of the location decision by foreign investors<sup>20</sup>. We assume that a foreign investor can choose from among 326 Chinese municipalities or other alternative countries to locate his investment. If the foreign investor decides to invest in municipality  $i$ , he maximizes his profits by choosing the level of investment, the quantity of land used as well as the quantity of labor hired in municipality  $i$ ,  $i = 0, 1, 2, \dots, 326$ , where  $i = 0$  denotes outside option such as investing in other countries.

<sup>20</sup>The Foreign Economic Research Institute of the NDRC (National Development and Reform Commission) carried out a survey in 2007 on foreign firms located in the Yangtze River Delta, Pearl River Delta and Areas Around Bohai. The top 5 ranked potential policy changes they worry about is Removing Tax Incentive, RMB Appreciation, Removing Favorable Land Policy, Increased Environmental Requirement and Increased Worker Welfare.

The investor's problem, conditional on investing in municipality  $i$ <sup>21</sup>, can be written as follows:

$$\begin{aligned} \underset{L_i, FDI_i, Land_i}{Max} \quad \pi_i &= (1 - \tau_i)(1 - t_i)(pq_i - w_i L_i - R_i Land_i - r FDI_i - F) \\ s.t. \quad q_i &= Q(FDI_i, Land_i, L_i) \end{aligned}$$

where:  $\pi_i$  = profits of the foreign investor if he invests in municipality  $i$ ;  $p$  = price of the product produced by the investor;  $q_i$  = quantity of the product sold;  $w_i$  = wage rate in municipality  $i$ ;  $L_i$  = quantity of labor employed by the foreign investor in municipality  $i$ ;  $R_i$  = land use fee paid by the foreign investor in municipality  $i$ ;  $Land_i$  = the land the foreign investor used for production in municipality  $i$ .  $r$  = opportunity cost of capital for the foreign investor;  $FDI_i$  = foreign direct investment by the foreign investor in municipality  $i$ ;  $F$  = fixed cost of production;  $t_i$  = corporate tax rate for the foreign investor in municipality  $i$ ;  $\tau_i$  = probability of expropriation.

Given the first order condition with respect to investment  $FDI_i$  and inputs decisions  $Land_i$ ,  $L_i$ , profits  $\pi_i^*$  will be a function of  $\tau_i, t_i, R_i, w_i$ . The foreign investor will choose the municipality with the highest  $\pi_i$  to locate its FDI<sup>22</sup>. Therefore, we can also model

$$FDI_i^* = f(\tau_i, t_i, R_i, w_i | \{i : \pi_i^* > \pi_j^*, \forall j \neq i\})$$

Provided the policy set of the Special Economic Zone experiment including property rights protection, i.e. lower  $\tau_i$ ; tax breaks, i.e. lower  $t_i$  and land fee discount, i.e. lower  $R_i$ , it implies an estimating equation of the form leading to empirical step one below<sup>23</sup>:

$$\ln FDI_{it} = \alpha + \eta * SEZdummy_{it} + X_{it}\beta + \xi_{it}$$

$X_{it}$  includes municipal control variables which would potentially influence the FDI decision in addition to property rights protection, tax rate and land use fee.

#### Capital Formation:

If the SEZ attracts FDI, it will in turn influence the capital formation process in the municipality. In particular,

$$\begin{aligned} \text{directly, } K_{ift} &= K_{ift-1} * (1 - \text{delta}) + FDI_{it}(SEZ)/\text{deflator} \\ \text{indirectly, } K_{idt} &= K_{idt-1} * (1 - \text{delta}) + DomI_{it}(SEZ)/\text{deflator} \end{aligned}$$

<sup>21</sup>The maximization problem captures the intensive effect, i.e. how much to invest in municipality  $i$  conditional on locating there.

<sup>22</sup>Comparing profits across all locating options, the investor chooses the one with the highest payoff. This decision essentially captures the extensive margin, i.e. whether or not to invest in municipality  $i$ .

<sup>23</sup>Due to data availability, the paper is not able to estimate the extensive margin (whether or not to invest in municipality  $i$ ) and intensive margin (how much to invest in municipality  $i$  conditional on locating there) separately. Therefore, the effect of SEZs on foreign direct investment is a combined intensive and extensive response.



where  $K_{ift}$  is foreign owned capital stock,  $FDI_{it}$  is foreign owned investment;  $K_{idt}$  is domestically owned capital stock,  $DomI_{it}$  is domestically owned investment. The interaction between domestic investment and foreign direct investment, i.e. crowding out or crowding in effect will determine the net effect of SEZs on capital formation. This drives the empirical step two below:

$$\begin{aligned} \ln DomI_{it} &= \phi + \gamma * SEZdummy_{it} + X_{it}\beta + \xi_{it} \\ \ln K_{idt} &= \phi + \gamma * SEZdummy_{it} + X_{it}\beta + \xi_{it} \end{aligned}$$

#### Technological Progress:

A very important policy motive behind subsidizing FDI is that FDI constitutes technologically more advanced capital compared to domestic capital. Based on Griliches (1986), the municipal aggregate production function can be modelled as

$$Y_{it} = A_i e^{\lambda_i t} (K_{it})^\alpha (H * L_{it})^{1-\alpha}$$

where  $K_{it} = (1 + \theta)K_{ift} + K_{idt}$ , using  $\theta > 0$  to denote higher quality of foreign capital compared to domestic capital;  $\alpha$  is the share of capital income in GDP<sup>24</sup>.  $Y_{it}$  is real gross domestic output in municipality  $i$  at year  $t$ ;  $H * L_{it}$  is augmented labor in municipality  $i$  at year  $t$ ;  $A_i$  is the time-invariant component of total factor productivity in municipality  $i$ ;  $\lambda_i$  is the existing TFP growth rate of municipality  $i$ .

$$\ln Y_{it} \simeq \ln A_i + \lambda_i t + \alpha \ln(K_{ft} + K_{dt}) + \alpha \theta \frac{K_{ft}}{K_{ft} + K_{dt}} + (1 - \alpha) \ln(HL_{it})$$

Let  $S = \frac{K_{ft}}{K_{ft} + K_{dt}}$  denote the share of foreign capital in the total capital stock, in terms of growth rate, we get

$$\begin{aligned} \frac{\Delta Y}{Y}_{it} &= \lambda_i + \alpha \frac{\Delta(K_{ft} + K_{dt})}{(K_{ft} + K_{dt})} + (1 - \alpha) \frac{\Delta(HL)}{(HL)_{it}} + \alpha \theta \frac{\Delta S}{S}_{it} \\ \frac{\Delta TFP}{TFP}_{it} &= \lambda_i + \alpha \theta \frac{\Delta S}{S}_{it} \end{aligned}$$

If there is any additional contribution  $\theta > 0$  due to the presence of FDI as a result of the SEZ experiment, we would conclude that FDI boosts the technological progress in the municipality. This drives empirical step three below<sup>25</sup>:

$$\frac{\Delta TFP}{TFP}_{it} = \lambda_i + \gamma * SEZdummy_{it} + \varepsilon_{it}$$

<sup>24</sup>The Chinese statistics only reports GDP by the income approach at the provincial level. Therefore, in the paper, I use provincial capital share as the proxy for municipal capital share. In a later empirical section, I compared estimates using provincial capital share and national capital share and show the results are not sensitive to the capital share indicator I used.

<sup>25</sup> $\gamma > 0 \iff \theta > 0$

To relate the basic model in Section 1.3 to my dynamic empirical setting, I run three empirical sections (i.e. Steps 1 to 3). In Step 1, I evaluate the extent to which foreign direct investment responds to property rights protection, tax breaks and the land use fee discount embodied in the Special Economic Zone experiment. In Step 2, I check the effect of the Special Economic Zone experiment on domestic investment and domestically owned capital stock. In Step 3, I examine whether the presence of FDI via the SEZs brings technology growth to a municipality.

#### 1.4 Empirical Step One: SEZs on FDI outcomes

##### 1.4.1 Identification

The empirical test requires variation in the timing when SEZs were created across my sample of municipalities. As described in Section 1.2, the timing of the SEZ experiment across the Chinese municipalities provides a significant amount of variation both between and within municipalities during my sample period 1978-2007. I will exploit these different sources of variation in my identification strategy.

**Baseline Specification** In the baseline specification, the econometric analysis makes use of the full sample of 326 municipalities. Thus, the effects of the SEZ experiment on the FDI outcome will be estimated both from the cross-sectional variation (municipalities with SEZs versus municipalities without SEZs) and from the time variation in the SEZ experiment among the 300 treated municipalities (a municipality before being treated versus after being treated). My econometric analysis is based on panel data regressions of the form:

$$Y_{ipt} = \alpha + \beta * SEZdummy_{ipt} + \delta_i + \gamma_t + \varepsilon_{ipt} \quad (1.1)$$

$$Y_{ipt} = \alpha + \beta * SEZdummy_{ipt} + \delta_i + \delta_p * (t - 1977) + \gamma_t + \varepsilon_{ipt} \quad (1.2)$$

$$Y_{ipt} = \alpha + \beta * SEZdummy_{ipt} + \delta_i + \delta_i * (t - 1977) + \gamma_t + \varepsilon_{ipt} \quad (1.3)$$

where  $Y_{ipt}$  is the outcome variable including foreign direct investment flow, exports and industrial output of foreign invested enterprises in municipality  $i$  of province  $p$  in year  $t$ .  $SEZdummy_{ipt}$  is the key variable indicating the Special Economic Zone experiment.  $\delta_i$  is the municipality fixed effect.  $\gamma_t$  is the year fixed effect.  $\delta_p$  is the province fixed effect.  $(t - 1977)$  is the trend starting from 1978 which is the beginning of my sample <sup>26</sup>.

In the first econometric setting (equation 1.1), I use the municipality fixed effect to control for time-invariant municipal characteristics such as natural endowment and geographical location and the year fixed effect to control for common macroeconomic shocks happening to all Chinese municipalities in a particular year. In the second

<sup>26</sup> As there are plenty of observations before the treatment (i.e. the SEZ experiment), linear trends are unlikely to pick up the post-treatment trends (Wolfers 2006).

econometric setting (equation 1.2), I use the municipality fixed effect to control for time-invariant municipal characteristics and the province specific trend to control for the common path of municipalities in the same province. This setting controls for time-varying factors at the provincial level that potentially influence the timing of SEZ granting. In the third econometric setting (equation 1.3), I use the municipality fixed effect to control for time-invariant municipal characteristics, the year fixed effect to control for common macroeconomic shocks to all municipalities at year  $t$  and municipality specific trends to control for time-varying reasons that municipalities were granted Special Economic Zone status. In this case, the identification of the effects of the Special Economic Zone experiment comes from whether such changes lead to deviations from municipality specific trends. Standard errors are heteroskedasticity-robust and clustered by municipality to deal with potential problems of serial correlation (Bertrand, Duflo and Mullainathan (2004)).

**Matching Specification** In the matching specification, the difference with respect to the baseline specification is that I no longer make use of the full sample of late treated municipalities. Instead, I take advantage of the cross-sectional variation found for several socioeconomic measures to restrict the sample of municipalities which were granted SEZs in later years to the ones that more closely match the earlier treated municipalities in indicators considered relevant for the timing of the SEZ experiment and for the outcomes under analysis, as of 1978. This procedure restricts the sample to 247 municipalities that are substantially more comparable in terms of the indicators considered at the beginning of my sample period.

According to state council documents, by the early 1990s, the Special Economic Zone experiment was granted mostly in coastal, more industrial developed and more educated areas. The selection criteria are likely to affect the propensity for a municipality to be granted SEZs earlier and are also likely to be instrumental in affecting FDI related outcomes. I create a  $D = 1$  if the municipality had the Special Economic Zone experiment by the end of 1992, i.e. earlier treated;  $D = 0$  if the municipality carried out the Special Economic Zone experiment after 1992, i.e. later treated<sup>27</sup>. I use per capita industrial output, per capita number of secondary school students in 1978 and distance to the nearest coast to estimate the propensity score based on a probit model

$$\Pr\{D = 1|X\} = \Pr\{D = 1|X = (\text{industrial output, education attainment, geographical location})\} = \phi(X'\beta)$$

In the matching exercise, I rank all 326 municipalities based on the estimated propensity score, and for each earlier treated municipality I select its closest later treated municipality as a control group (nearest neighbor approach). In the matched sample, I have 247 municipalities, among which 167 municipalities were granted SEZs

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<sup>27</sup>The matching exercise was implemented based on the advice from Joshua Angrist.

between 1979 and 1992 and 80 municipalities were allowed to create SEZs after 1992<sup>28</sup>. Table 1.3 displays the probit regression results and the quality before and after using nearest-neighbor matching. Since we do not match the sample conditioning on all covariates but on the propensity score, it has to be examined if the matching procedure is able to balance the distribution of the relevant variables in both the control and treatment group. There are two measures to check whether there remain any differences after conditioning on the propensity score. First, the pseudo-R<sup>2</sup>: Sianesi (2004) suggests reestimating the propensity score on the matched sample, that is only on participants and matched non-participants and compare the pseudo-R<sup>2</sup>s before and after matching. The pseudo-R<sup>2</sup> indicates how well the regressors  $X$  explain the participation probability. After matching there should be no systematic differences in the distribution of covariates between both groups and therefore, the pseudo-R<sup>2</sup> should be fairly low. Table 1.3a indicates that before matching the Pseudo-R<sup>2</sup> is 0.10; after matching, the Pseudo-R<sup>2</sup> reduces to 0.03. Second, T-test: in Table 1.3b, the T-test suggests that all three important selection criteria become insignificant after matching, which means there are no systematic differences in the distribution of covariates between the control group (the municipalities which had SEZs in later years) and the treatment group (the municipalities which had SEZs in earlier years). This matching procedure reduces the size of the sample available for econometric analysis, but increases my confidence that I am effectively tracking municipalities across time that are more comparable in aspects that are relevant for the effects I want to estimate.

**Later SEZs Only Specification** The matching procedure above does not completely eliminate concerns about the existence of unobservable factors that might systematically affect the likelihood of being granted SEZs earlier and also affect the outcome variables of interest. It is possible, for instance, that the municipalities which were granted SEZs earlier could have very different abilities for attracting FDI compared to municipalities which were granted SEZs later on. These specific characteristics might have led them to be granted SEZs earlier on and perform more successfully in FDI absorption. The positive correlation between the SEZ experiment and FDI related outcome observed in the full sample may be wrongly interpreted as capturing the impact of the SEZs, if only the group of earlier treated municipalities drove the main results. To address this concern I restrict the sample available for analysis to the group of municipalities which only had SEZs since 1990s. The sample drops 79 municipalities which were allowed to construct SEZs between 1979 and 1990 and is therefore reduced to a group of 247 municipalities.<sup>29</sup>

<sup>28</sup>Refer to Caliendo and Kopeinig (2008) for practical guidance on propensity score matching; Rosenbaum and Rubin (1983) for the principle of matching. I have checked the common support and the balancing properties, which were all satisfied in my matching exercise. Some municipalities in the control group were used more than once in the matching, i.e. matching with replacement.

<sup>29</sup>Though in matching, the number of the sample is 247 municipalities as well, the composition of matched sample and later SEZs sample is different.

### 1.4.2 Empirical Results

In Table 1.4, Panel A, I run a regression using per capita foreign direct investment, which is the first-order target of the Special Economic Zone experiment. In Panel B, I run a regression using per capita exports, which is another goal of the Special Economic Zone policy to boost trade related activities. In Panel C, I run a regression using per capita industrial output of foreign invested enterprises, which is to confirm that foreign direct investment came to municipalities with the Special Economic Zone experiment to produce and export its product.

In Table 1.4, Panel A, Columns (1) to (3), the results are robust to baseline specifications. In Column (3), after controlling for fixed effects and municipality specific trend, the results suggest that having Special Economic Zone status increases per capita foreign direct investment by 58%. Column (4) reports the estimates for the restricted matched sample. The results still suggest the SEZ experiment increases per capita FDI by 54%. In Column (5), when I only use the group of the municipalities which were granted SEZs after 1990, the magnitude of the coefficient slightly decreased, but still suggests a 43% increase due to the SEZ experiment.

In Panel B, Column (3) indicates that having the SEZ experiment increases municipal per capita exports by 84%. Column (4) reports the estimates for the restricted matched sample. The result suggests the SEZ experiment increases per capita exports by 81%. In Column (5), when I only use the group of the municipalities which were granted SEZs after 1990, the magnitude of the coefficient still suggests a 70% increase in exports due to the SEZ experiment. The estimates confirm the contribution of the Special Economic Zone experiment on attracting vertical FDI, which takes advantage of low-cost production in China for products to be exported and which is fueled mostly by China's Asian neighbors<sup>30</sup>.

In Panel C, Column (3) indicates that having the SEZ experiment increases per capita industrial output of foreign invested enterprises by 64%. Column (4) reports the estimates for the restricted matched sample. The result suggests the SEZ experiment increases per capita industrial output of foreign invested enterprises by 69%. In Column (5), when I only use the group of the municipalities which were granted SEZs after 1990, the magnitude of the coefficient still suggests a 45% increase due to the SEZ experiment.

### 1.4.3 Robustness Check

**Placebo Test** There are concerns that foreign firms anticipate the SEZ establishment and thus delay their investment projects to coincide with the opening of the SEZ. If it was the case, the positive coefficient of *SEZdummy* in equation (1.3) might just reflect foreign firm's reallocation of investment across time, which is wrongly interpreted as the causal effect of SEZs on FDI. To validate the identifying assumption,

<sup>30</sup>Refer to Whalley & Xin (2006) and Ekholm et al. (2007).

I estimate the dynamics of FDI related outcome before and after the SEZ experiment. Specifically, I replace *SEZdummy* in equation (1.3) with the set of year-wise dummy variables which equal to one if  $n$  years have passed since the year of having the Special Economic Zone experiment, where  $-2 \leq n \leq 2$ , and another dummy variable equal to 1 if three years or more have passed.

$$Y_{ipt} = \alpha + \sum_{n=-2}^2 \beta_n * D(T+n)_{ipt} + \beta_3 * D(T+3)_{ipt} + \delta_i + \delta_i * (t-1977) + \gamma_t + \varepsilon_{ipt} \quad (1.4)$$

Table 1.5 reports the estimates on the coefficient of the set of dummy variables. The point estimates suggest that there was no hike or dip before the SEZ experiment took place and that the increase in FDI related outcome started only after the experiment. As a result, there is no anticipation of SEZs by foreign firms, encouraging the interpretation that SEZs have attracted FDI, increased exports and industrial output by foreign invested enterprises.

**Test for Diversion Effect** There are concerns that the foreign direct investment SEZs attract is not from creation effect, but from diversion effect. When the SEZ experiment is in place, foreign investors might change their location decision from neighboring non-SEZ municipalities or neighboring non-SEZ provinces to municipalities with SEZs. If this is the case, SEZs merely redistribute FDI within Chinese municipalities. As a result, I consider two possible diversion cases as follows:

Case I: Municipalities with SEZs divert FDI from neighboring municipalities with no SEZs, i.e. a change of distribution within the province. The prediction of full diversion story in Case I will be that at the provincial level, the number of municipalities with SEZs does not matter for the level of per capita FDI a province attracts. Figure 1.4 shows that there is a strong positive correlation between the proportion of municipalities with SEZs in the province and per capita provincial FDI, which contradicts the full diversion story.

Case II: Municipalities with SEZs divert FDI from other provinces with no SEZs, i.e. a change of distribution within China. It is possible that when some municipalities carry out the SEZ experiment, the FDI attracted is diverted from other provinces. The empirical prediction will be that at national level, the number of municipalities with SEZs does not matter for the level of per capita FDI China attracts. This possibility of full diversion is ruled out by Figure 1.1, which shows a clear positive correlation between the number of municipalities with SEZs and the FDI China attracts.

Though the most extreme version of the diversion story where there is no creation at all can be ruled out, there might be partial diversion. The ideal test to separately identify the creation effect and diversion effect will be to regress the municipal FDI on its own *SEZdummy* and the indicator of other SEZ in the same province or nearby

provinces.

$$Y_{ipt} = \alpha + \beta_1 * SEZdummy_{ipt} + \beta_2 * OtherSEZ_{ipt} + \delta_i + \delta_i * (t - 1977) + \gamma_t + \varepsilon_{ipt} \quad (1.5)$$

We would expect a positive coefficient,  $\beta_1$ , of its own *SEZdummy* to capture the creation effect and a negative coefficient,  $\beta_2$ , of the dummy variable indicating if there is any other nearby SEZ for the diversion effect.  $OtherSEZ_{ipt} = 1$  if there is any other SEZ in the same province or nearby provinces;  $OtherSEZ_{ipt} = 0$  otherwise.

In Panel A, B and C of Table 1.6, the coefficients of *SEZdummy* are all positive and the magnitude remains similar to those in Table 1.4. It confirms that there is significant creation effect by the SEZ experiment on the municipal FDI outcome. The coefficients of *OtherSEZ* are negative and significant, suggesting that there is indeed sizable diversion effect by other nearby SEZs. The magnitude of the creation effect is larger than the diversion effect, which provides us with the relative importance of those two effects. In Panel C, for industrial output of foreign enterprises, the coefficients of *OtherSEZ* are larger than those of *SEZdummy*, which might be due to the truncated sample size. The statistics of foreign industrial output only cover years being 1987-1991 and 1999-2008.

### 1.5 Empirical Step Two: SEZs and Domestic Capital Formation

In this section, I investigate the effect of SEZs on domestic capital formation. On the one hand, foreign direct investment flow may reduce domestic investment due to crowding-out and competition, which might decrease the impact of the SEZ experiment on domestically owned capital stock. On the other hand, the SEZs may bring benefits and spillovers to domestic firms. Complementary domestic investment may increase if the foreign investment projects become integrated in the domestic industrial chain and establish forward and backward linkages. The econometric specifications I used in this section to control endogeneity are similar to section 1.4 (empirical step one).

In Table 1.7, Panel A contains regression on domestic investment at the municipal level. Panel B contains regressions on municipal physical capital stock (domestically owned capital stock). In Panel A, Columns (1) to (5), under different specifications, there is no significant evidence suggesting sizable effect of domestically owned investment by the SEZs. According to the aggregate municipal data, each unit of FDI will contribute to the capital formation process without reducing domestic capital accumulation<sup>31</sup>. However, the results cannot rule out the existence of either crowding-out

<sup>31</sup>Yasheng Huang (2003), "the large absorption of foreign direct investment (FDI) by China is a sign of some substantial weaknesses in the Chinese economy. The primary benefits associated with China's FDI inflows are concerned with the privatization functions supplied by foreign firms, venture capital provisions to credit-constrained private entrepreneurs, and promotion of interregional capital mobility. Huang (2003) argues that one should ask why domestic firms cannot supply the same functions. China's partial reforms, while successful in increasing the scope of the market, have so far failed to address many allocative inefficiencies in the Chinese economy".

or crowding-in effect by the foreign direct investment. Since the data only reports the aggregate municipal investment rather than investment at more disaggregated firm level, the insignificant coefficient of *SEZdummy* on domestic investment may reflect offsetting effects of crowding-out and crowding-in. In Panel B, Columns (1) to (5), under different specifications, indicate that having the SEZ experiment has no significant net effect on domestically owned capital stock, which is consistent with the pattern in domestic investments<sup>32</sup>.

## 1.6 Empirical Step Three: SEZs and Total Factor Productivity Growth

### 1.6.1 Empirical Strategy

Following Young (2003), let gross domestic output be a constant return to scale function of capital and labor inputs (human capital augmented)

$$Y = F(K, H * L, t)$$

where the appearance of  $t$ , time, as an independent argument denotes the fact that the production function evolves over time due to technological progress.

Totally differentiating and dividing by GDP, we find that

$$\frac{dY}{Y} = \left(\frac{F_K K}{Y}\right) \frac{dK}{K} + \left(\frac{F_{HL} HL}{Y}\right) \frac{dHL}{HL} + \frac{F_t}{Y} dt$$

where  $F_i$  represents the partial derivative of  $F$  with respect to argument  $i$ . With competitive markets, factors are paid their marginal products, so that the terms in parentheses on the right-hand side represent the share of each factor in total factor payments. Total factor productivity growth, the last term on the right-hand side, represents the proportional increase in output that would have occurred in the absence of any input changes and is calculated as a residual item by subtracting the contribution of capital and labor from output growth:

$$\frac{\Delta TFP}{TFP} = \frac{\Delta Y}{Y} - \theta_k \frac{\Delta K}{K} - (1 - \theta_k) \frac{\Delta(H * L)}{(H * L)}$$

Caselli (2005) and Young (2003) use growth accounting to calculate total factor productivity<sup>33</sup>. A very important step is to estimate labor shares. The most disaggregated GDP data Chinese official statistics provide using the income approach is at

<sup>32</sup>I also run regressions on total municipal capital stock and find no strong impact of the SEZs. A supporting fact will be that the average ratio of foreign direct investment to total municipal investment is 0.04 during the sample period (1978-2007). This might explain why we do not observe significant increase in total capital stock by the Special Economic Zone experiment. However, I do get strong results of the SEZs on foreign owned capital stock.

<sup>33</sup>Note that estimating TFP based on estimating a production function is heavily exposed to the endogeneity problem. All inputs, including capital and labor, are endogenous decisions, which are correlated with the unobserved error term. There is no good instrumented variable for them at the municipal level.



the provincial level.<sup>34</sup> In the main regression, I use the provincial capital share as a proxy for the municipal capital share. As comparison groups, I also use national capital share  $\theta_k = 0.4$  reported in Young (2003) and international benchmark in Caselli (2005)  $\theta_k = 1/3$  as a proxy for municipal capital share.

If we assume each municipality has a time-invariant level of total factor productivity and its own trend of technology progress, the Special Economic Zone experiment changed the trend of its TFP growing path, then

$$\Delta TFP_{ipt} = \delta_i + r * SEZdummy_{ipt} + \Delta \varepsilon_{ipt} \quad (1.6)$$

From 1978 to 2007, China also carried out other reforms. To control for common macroeconomic events which might influence the growth rate of TFP, I further add year fixed effect into the regression, i.e.

$$\Delta TFP_{ipt} = \delta_i + \gamma_t + r * SEZdummy_{ipt} + \Delta \varepsilon_{ipt} \quad (1.7)$$

### 1.6.2 Empirical Results

In Table 1.8, Column (2), with the most rigorous specification (equation 1.7), suggests that having a Special Economic Zone status increases total productivity growth by 0.6 percentage points<sup>35</sup>. To compare this contribution with average TFP growth at the municipal level, 2.6% during the sample period, SEZs (therefore FDI) have increased TFP growth rate by 23%.

The regression results from Column (4) where I use Young's (2003) national average capital share  $\theta_k = 0.4$ , and Column (6) where I use Caselli's (2005) international benchmark  $\theta_k = 1/3$ , are similar. The fact that the estimates are not sensitive to whether I use the provincial average share or national average share mitigates the concern that using upper level capital share would cause large measurement error.

## 1.7 Conclusion

By exploiting the extensive establishment of Special Economic Zones in China since 1979, my paper makes three contributions to our understanding of the impact of special economic zones on foreign direct investment and other economic outcomes. Using a comprehensive and unique dataset on Chinese municipalities from 1978 to 2007, my first contribution is to estimate the effect of Special Economic Zones on attracting foreign direct investment. I find that the policy package, including private property rights protection, tax breaks and land use policy, increases per capita municipal foreign direct investment by 58% in the form of foreign-invested and export-oriented industrial enterprises. While it is possible that Special Economic Zones were deliberately

<sup>34</sup>See Hsueh and Li (1999) for 1978-95, NBS (2006) for 1993-2004.

<sup>35</sup>I have run a placebo test for TFP growth using two dummies indicating one year, two years before the SEZ experiment as well as the reform variable, *SEZdummy*. The coefficients for the two pre-reform dummies are not significant, while the coefficient for *SEZdummy* does not change much.

allocated to municipalities on the basis of time-varying characteristics unobservable to economists today, I find little evidence for this potential source of bias to my results using municipality specific trends, matched sample, restricted sample and a placebo test. There are also concerns that the effect of SEZs on FDI might be merely a reflection of diversion effect, i.e. a change of distribution across municipalities. It is ruled out by robustness checks at provincial and national level.

My second contribution is to map foreign direct investment by multinational firms to municipal macroeconomic outcomes. I find that the Special Economic Zone experiment increased municipal foreign owned capital stock and did not reduce domestic capital (and investment).

My third contribution is to check in addition to physical capital, whether Special Economic Zones bring more advanced technology, i.e. higher total factor productivity growth. I find that the Special Economic Zone experiment increased municipality TFP growth by 0.6 percentage points. The results are robust to various capital share proxies. By exploiting a growth accounting framework, my work provides the mechanisms of gains from Special Economic Zones: one channel is through increasing physical capital stock; the other is via boosting total factor productivity growth.

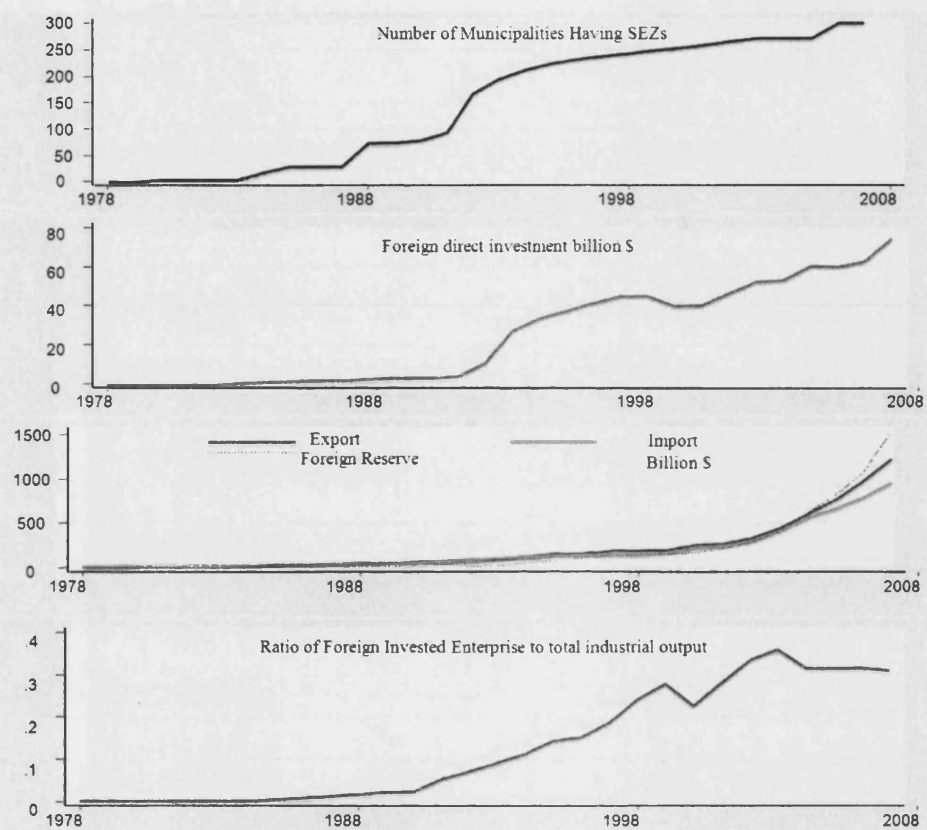
This paper's findings pose several questions for future research. First, among the incentive package Special Economic Zones provided, what is the elasticity of foreign direct investment with respect to property rights protection, tax breaks, land use policy and other elements respectively? Micro-level surveys on Special Economic Zones can generate promising results on this issue. Second, newly issued data on Special Economic Zones also provides good opportunities to test the fiscal impact of tax breaks specifically for foreign investors on municipal public good provision. Third, further work could be done on evaluating whether the Special Economic Zone policy (i.e. subsidies to foreign investors) raise municipal welfare<sup>36</sup>. Therefore, a cost-benefit analysis based on Special Economic Zone policies should be carried out.

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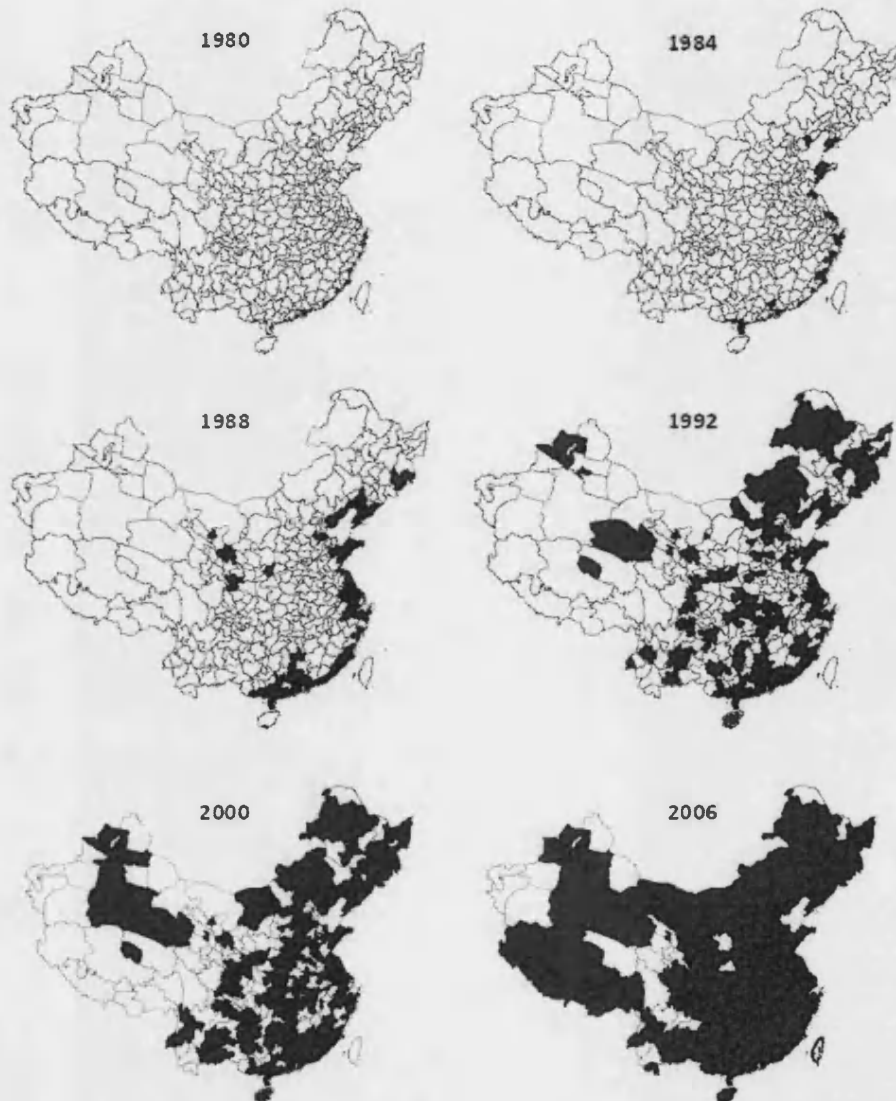
<sup>36</sup>Refer to Gordon H. Hanson (2001). He presents a simple theoretical model for evaluating FDI promoting policies in G-24 countries.

## 1.8 Figures and tables

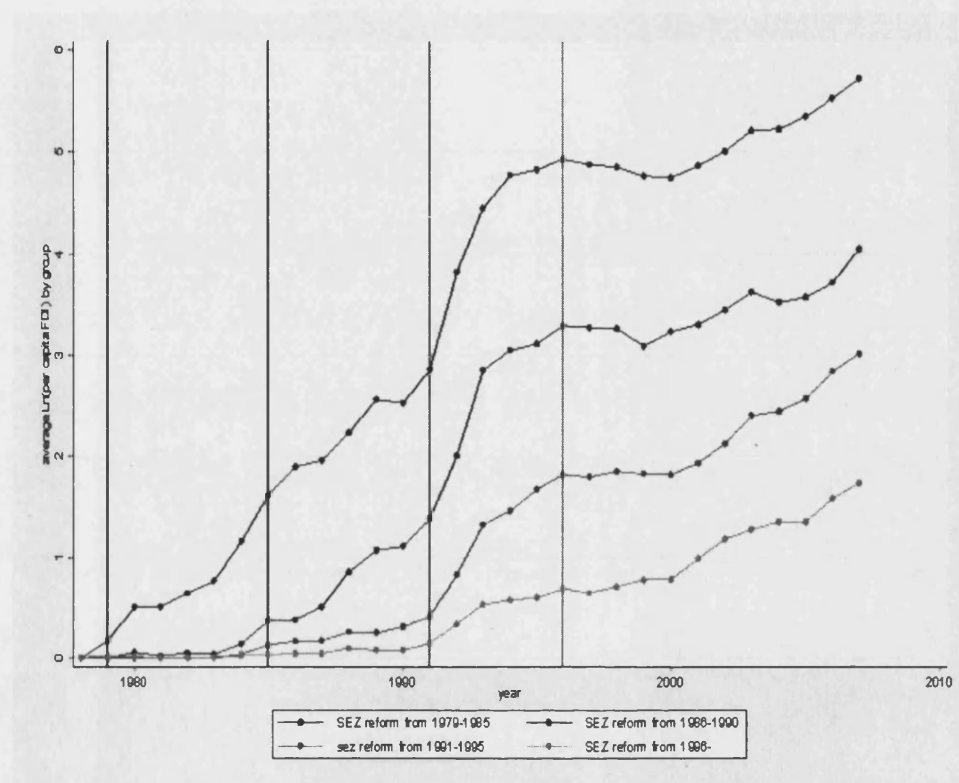
Figure 1.1: SEZs, FDI and Trade Outcome



Note: the graph displays the significant correlation between the SEZ experiment and FDI outcome in China.

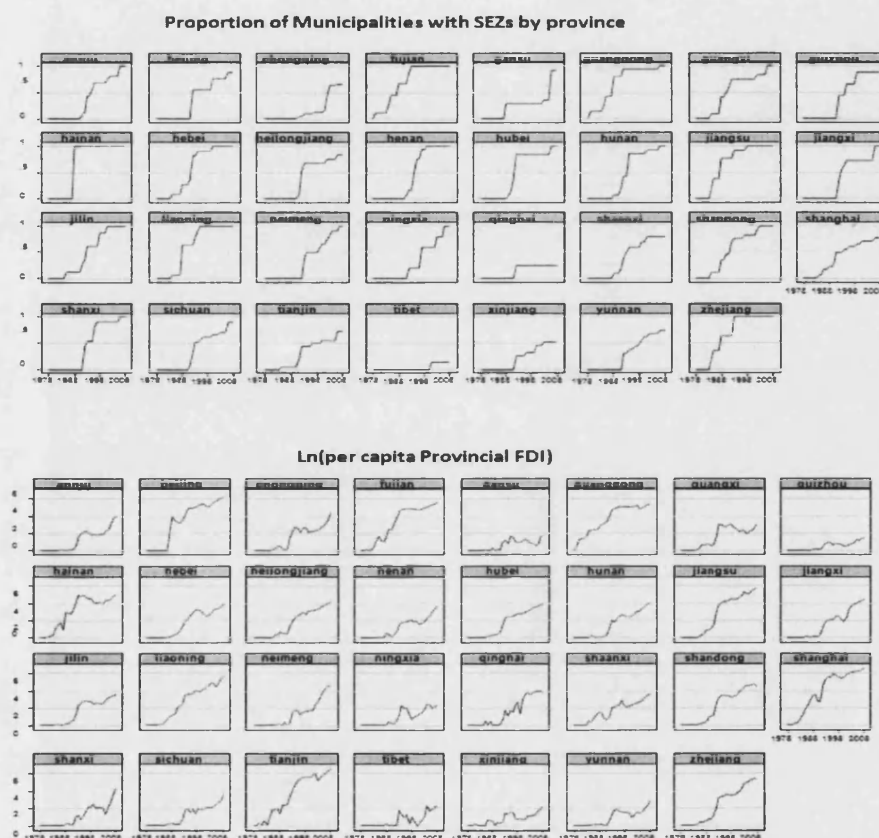
**Figure 1.2:** Geographic Evolution of Special Economic Zone Experiment

Note: if a whole municipality was granted the status of Open Special Economic Zone; or within the municipality, only a certain geographical area was granted to establish state-level economic zones, or province-level economic zones, the municipality was entitled to use preferential policy (including property rights protection, tax break, cheaper land bill, etc.) to attract foreign direct investment. Therefore, I define the municipality to be a Special Economic Zone (SEZ) from a general prospective.

**Figure 1.3:** Difference-In-Difference Graph of SEZ on FDI outcome

Note: we classify 326 municipalities into four groups based on their timing of carrying out the Special Economic Zone experiment. Group 1 is composed of municipalities which were exposed to the SEZ reform in the early 1980s (1980-1985); Group 2 is composed of municipalities which had the SEZ experiment in the late 1980s (1986-1990); Group 3 is composed of municipalities which had been granted the SEZ experiment in the early 1990s (1991-1995); Group 4 includes municipalities which had the SEZ reform since the late 1990s. The graph displays the sample mean of per capita FDI by year by group without controlling for any municipal characteristics and macroeconomic shocks.

Figure 1.4: SEZs and Provincial FDI



Note: the graph illustrates the proportion of municipalities with SEZs in each province and Ln(per capita provincial FDI). This is to address the concern that the FDI SEZs attract at the municipal level comes from the diversion effect, i.e. redistribution of FDI across municipalities that have SEZs and those have no SEZs (within the same province). There is a strong positive correlation between the proportion of municipalities with SEZs in the province and per capita provincial FDI, which should be null if it is merely a diversion effect.

**Table 1.1:** The Granting Sequence of SEZs

Variables	1978	1979-1985	1986-1990	1991-1995	1996-2007
1. Number of municipalities newly granted SEZs	0	30	49	145	76
2. Number of municipalities with SEZs	0	30	79	224	300
3. Total Number of municipalities	326	326	326	326	326
4. Ratio of municipalities with SEZs	0.0	0.09	0.24	0.69	0.92
5. Average Distance to the coast	-	0.15	1.34	3.75	6.26
6. Average per capita industry output in 1978	-	806	611	429	263
7. Average per capita number of secondary students 1978	-	0.064	0.060	0.066	0.057

Notes: based on the timing of granting SEZs, I classify the sample into 4 groups. The distance to the nearest coast, unit: 100 miles; Per capita industrial output in 1978, unit: RMB; Per capita enrolled secondary school students in 1978, unit: person.

Table 1.2: Sample Descriptive Statistics

Variables	Number of Observations	Beginning of Available data	End of Available data
<b>a. SEZ experiment</b>			
Special Economic Zone Index	9778	0.00 (0.00)	0.92 (0.27)
<b>b. FDI related outcome</b>			
FDI per capita (US dollar)	9755	0.00 (0.03)	82.79 (162.38)
Exports per capita (US dollar)	9733	2.34 (17.59)	811.60 (2892.22)
FIE industrial output per capita (RMB)	3667	26.16 (232.98)	9930.44 (26940.67)
<b>c. Growth accounting data</b>			
RealGDP per capita (RMB)	9771	389.16 (314.11)	6467.79 (6242.15)
Domestic capital stock per capita	9677	355.96 (890.33)	13691.16 (11257.42)
Foreign capital stock per capita	9667	0.00 (0.04)	1295.41 (2834.58)
Labor (10,000)	9779	126.2 (112.95)	220.08 (174.88)
Average schooling year in 1982	325	5.12 (0.78)	

Notes: Robust standard errors in parentheses. Special Economic Zone index is a dummy variable which indicates whether the municipality carried out the SEZ experiment. Detailed construction procedure is described in section 1.2.2.



**Table 1.3:** Propensity Score Matching: Nearest Neighbor Approach

a. Probit Regression Results	
Variable	Coefficient (std. error)
Industry output78	0.0006*** (0.0002)
Secondary student78	-3.0710 (3.3481)
Distance	-0.0930*** (0.0197)
Log Likelihood	-204.11
Pseudo R-squared	0.096
Number of Obs.	326

Notes: Robust standard errors in parentheses. \* denotes significant at 10%, \*\* significant at 5% and \*\*\* significant at 1%. Industry output78 denotes the per capita industrial output in 1978, unit: RMB; Secondary student78 denotes per capita enrolled secondary school students in 1978, unit: person; Distance denotes the distance to the nearest coast, unit: 100 miles.

b. Comparison Before and After Matching							
Variable	Sample	Mean		Percent Bias	Reduction in  bias	t-test	
		Treated	Control			t	p> t
Industry output78	Unmatched	565.26	307.43	46.0		4.13	0.000
	Matched	565.26	595.22	-5.3	88.4	-0.42	0.672
Secondary student78	Unmatched	0.064	0.060	15.8		1.43	0.153
	Matched	0.064	0.065	-3.8	76.0	-0.34	0.734
Distance	Unmatched	2.69	5.06	-60.1		-5.44	0.000
	Matched	2.69	2.91	-5.7	90.4	-0.64	0.526

Notes: Matched denotes the case after propensity score matching is done; Unmatched denotes the case before propensity score matching is done. Treated denotes the group of municipalities which were granted SEZs by 1992; Control denotes the group which have not yet carried out the SEZ experiment by 1992.

**Table 1.4:** Step One: the SEZ Experiment on FDI Outcome

Panel A	Ln(foreign direct investment per capita)				
	(1)	(2)	(3)	Matched Sample	Later SEZ Sample
SEZdummy	0.723*** (0.079)	0.478*** (0.056)	0.460*** (0.053)	0.434*** (0.061)	0.355*** (0.061)
Municipality FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Province Trend	-	Yes	-	-	-
Municipality trend	-	-	Yes	Yes	Yes
Observations	9772	9772	9772	7405	7404
R-squared	0.761	0.845	0.891	0.898	0.845
Panel B	Ln(exports per capita)				
	(1)	(2)	(3)	Matched Sample	Later SEZ Sample
SEZdummy	0.871*** (0.098)	0.719*** (0.080)	0.608*** (0.082)	0.595*** (0.096)	0.531*** (0.092)
Municipality FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Province Trend	-	Yes	-	-	-
Municipality trend	-	-	Yes	Yes	Yes
Observations	9733	9733	9733	7391	7376
R-squared	0.833	0.877	0.922	0.927	0.898
Panel C	Ln(Industrial output of foreign invested enterprises per capita)				
	(1)	(2)	(3)	Matched Sample	Later SEZ Sample
SEZdummy	0.307** (0.137)	0.275** (0.124)	0.497*** (0.128)	0.525*** (0.130)	0.375** (0.184)
Municipality FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Province Trend	-	Yes	-	-	-
Municipality trend	-	-	Yes	Yes	Yes
Observations	3667	3667	3667	3055	2604
R-squared	0.906	0.922	0.943	0.946	0.935

Notes: Robust standard errors in parentheses. Standard errors are adjusted for clustering at municipality level. \* denotes significant at 10%, \*\* significant at 5% and \*\*\* significant at 1%. Panel A evaluates the effect of the SEZ experiment on per capita FDI; Panel B examines whether the SEZ experiment promotes trade; Panel C checks the industrial output by foreign invested enterprises.

**Table 1.5:** Step One: Robustness Check A

Variable	Placebo Test		
	Panel A Ln(per capita FDI)	Panel B Ln(per capita exports)	Panel C Ln(per capita FIE output)
SEZ(-2)	-0.00594 (0.0395)	0.0395 (0.0591)	-0.123 (0.108)
SEZ(-1)	0.0464 (0.0470)	0.125* (0.0696)	0.0215 (0.163)
SEZ(+0)	0.150*** (0.0562)	0.354*** (0.0871)	0.205 (0.210)
SEZ(+1)	0.376*** (0.0678)	0.507*** (0.101)	0.631*** (0.201)
SEZ(+2)	0.445*** (0.0734)	0.630*** (0.112)	0.466* (0.250)
SEZ(3+)	0.880*** (0.0834)	1.024*** (0.123)	0.765*** (0.254)
Municipality FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Municipality trend	Yes	Yes	Yes
Observations	9772	9733	3667
R-squared	0.897	0.925	0.944

Notes: Robust standard errors in parentheses. Standard errors are adjusted for clustering at municipality level. \* denotes significant at 10%, \*\* significant at 5% and \*\*\* significant at 1%. SEZ(+n) are dummies denoting n years after the SEZ experiment.

Table 1.6: Step One: Robustness Check B

Test for Diversion Effect			
Panel A	Ln(foreign direct investment per capita)		
	Full Sample	Matched Sample	Later SEZ Sample
SEZdummy	0.452*** (0.052)	0.429*** (0.060)	0.352*** (0.061)
OtherSEZ	-0.271*** (0.043)	-0.319*** (0.054)	-0.141*** (0.035)
Municipality FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Municipality trend	Yes	Yes	Yes
Observations	9772	7405	7404
R-squared	0.892	0.899	0.845
Panel B	Ln(exports per capita)		
	Full Sample	Matched Sample	Later SEZ Sample
SEZdummy	0.600*** (0.081)	0.591*** (0.095)	0.529*** (0.092)
OtherSEZ	-0.255*** (0.047)	-0.278*** (0.060)	-0.089** (0.042)
Municipality FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Municipality trend	Yes	Yes	Yes
Observations	9733	7391	7376
R-squared	0.923	0.927	0.898
Panel C	Ln(Industrial output of foreign invested enterprises per capita)		
	Full Sample	Matched Sample	Later SEZ Sample
SEZdummy	0.491*** (0.127)	0.519*** (0.129)	0.378** (0.184)
OtherSEZ	-0.630*** (0.150)	-0.747*** (0.181)	-0.248 (0.159)
Municipality FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Municipality trend	Yes	Yes	Yes
Observations	3667	3055	2604
R-squared	0.944	0.946	0.935

Notes: Robust standard errors in parentheses. Standard errors are adjusted for clustering at municipality level. \* denotes significant at 10%, \*\* significant at 5% and \*\*\* significant at 1%. Panel A, B, C evaluate the creation effect and diversion effect of the SEZ experiment on per capita FDI, trade and industrial output by foreign invested enterprises respectively. The coefficient of SEZdummy captures the creation effect. The coefficient of OtherSEZ dummy variable captures the diversion effect.

**Table 1.7:** Step Two: SEZs on Domestically Owned Capital Formation

Panel A	Ln(Real Domestic Investment)				
	Full Sample			Matched	Later SEZ
	(1)	(2)	(3)	Sample	Sample
SEZdummy	0.044 (0.044)	-0.048 (0.039)	0.067** (0.033)	0.087** (0.037)	-0.017 (0.040)
Municipality FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Province Trend	-	Yes	-	-	-
Municipality trend	-	-	Yes	Yes	Yes
Observations	9732	9732	9732	7364	7399
R-squared	0.931	0.942	0.960	0.961	0.960
Panel B	Ln(Real Domestically Owned Capital Stock)				
	Full Sample			Matched	Later SEZ
	(1)	(2)	(3)	Sample	Sample
SEZdummy	0.027 (0.038)	0.012 (0.033)	0.067*** (0.022)	0.078*** (0.025)	0.023 (0.025)
Municipality FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Province Trend	-	Yes	-	-	-
Municipality trend	-	-	Yes	Yes	Yes
Observations	9669	9669	9669	7301	7379
R-squared	0.958	0.967	0.986	0.986	0.986

Notes: Robust standard errors in parentheses. Standard errors are adjusted for clustering at municipality level. \* denotes significant at 10%, \*\* significant at 5% and \*\*\* significant at 1%. Panel A checks the effect of the SEZ experiment on domestically owned investment; Panel B checks the effect of the SEZ experiment on domestically owned capital stock.

Table 1.8: Step Three: SEZs on TFP Growth

	TFP Growth					
	K share=provincial average		K share=national average		K share=1/3	
	(1)	(2)	(3)	(4)	(5)	(6)
SEZdummy	0.035*** (0.002)	0.006** (0.003)	0.034*** (0.002)	0.006* (0.003)	0.035*** (0.002)	0.007** (0.003)
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	-	Yes	-	Yes	-	Yes
Observations	9440	9440	9440	9440	9440	9440
R-squared	0.071	0.132	0.072	0.132	0.074	0.136

Notes: Robust standard errors in parentheses. Standard errors are adjusted for clustering at municipality level. \* denotes significant at 10%, \*\* significant at 5% and \*\*\* significant at 1%. In column (1) and (2), I use the most disaggregate capital share available, i.e. province level average capital share; in column (3) and (4), I use Young's (2003) national average capital share; in column (5) and (6), I use the international benchmark capital share as in Caselli (2005).

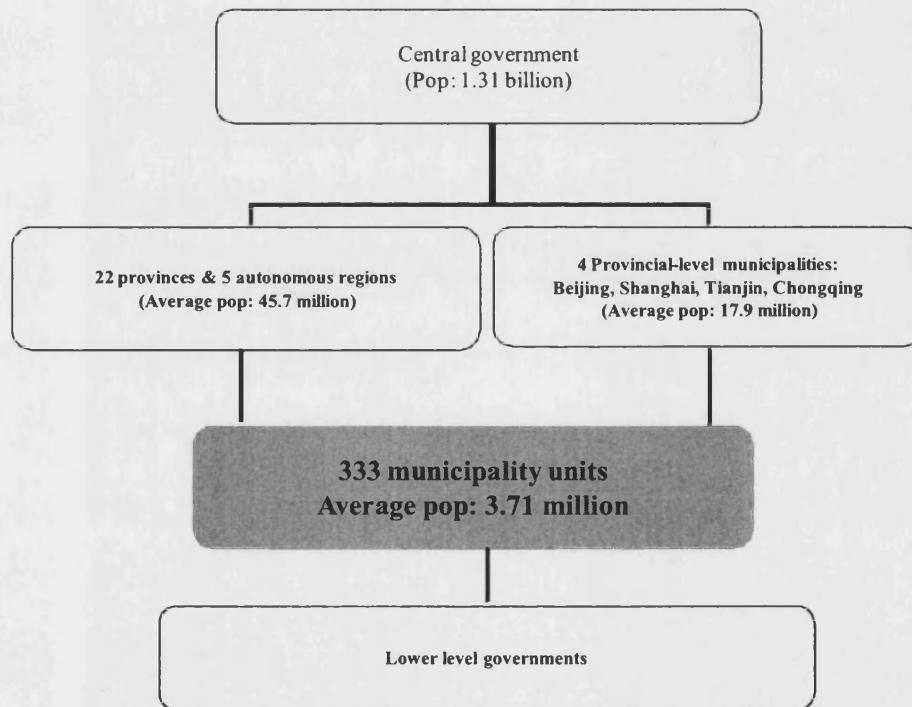
## A Data Appendix

This appendix provides information (supplementary to that in section 1.2.2) on the variables used in this paper.

### Sample of Municipalities:

The dataset includes 326 municipalities of 31 provinces in China. I combine Fuyang and Bozhou in Anhui Province to be one municipality, and Baicheng and Songyuan to be one municipality due to statistical availability. I omit Laibin and Chongzuo of Guangxi Province since they were only established in the early 2000s. Due to statistical availability, I treat Tibet as a big municipality.

**Government Organization Structure in China, 2005**



### Statistical Source:

1. 30th anniversary of opening up Reform statistical books 1978-2008 (Beijing, Chongqing, Fujian, Gansu, Guangdong, Guizhou, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Neimeng, Shandong, Shanghai, Shanxi, Sichuan and Tianjin).
2. 50th anniversary of People's Republic of China (1949-1999) statistical yearbooks (Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hebei, Henan, Hunan, Jiangsu, Jiangxi, Liaoning, Neimeng, Shandong, Shanxi, Sichuan, Xinjiang, Yunnan, Zhe-

jiang Province).

3. Province statistical yearbooks (1980s,1990s,2000s).
4. China city statistical yearbooks (1985-2008).
5. China city 50 years (1949-1999).
6. China regional statistical yearbooks (2000-2008).
7. China custom statistics (1994-2008).
8. Municipal statistical bureau website.
9. Tien-Tung Hsueh and Qiang Li (eds.) (1999), China's National Income: 1952-1995.
10. National Statistical Bureau, Data of Gross Domestic Product of China (1952-2004).

#### Growth Accounting Variable:

1. Deflator for GDP and Investment: Municipal GDP (investment) deflator

The statistical office of most countries estimate real GDP by deflating nominal GDP using separate, independently constructed, price indices. However, this is not the procedure in China. Local statistical bureaus are called on to report the value of GDP in current and constant (base year) prices. The difference between the two series produces an implicit deflator, which is then used to deflate nominal value added. Based on GDP at current price and the GDP index at constant price (GDP index at 1978=100), I calculate the GDP deflator for most municipalities. For a few municipalities located in Gansu, Anhui, Shaanxi, Jilin and Liaoning Province whose municipal GDP indices are not available, I use the provincial GDP deflator as a proxy. This municipal deflator is for the first time applied to growth accounting work in China's studies and avoid measurement error by using the provincial deflator.

2. Real Physical Capital Stock

This is calculated based on the investment, investment deflator, depreciation rate and average geometric growth rate of investment. Following Caselli (2005), Caselli (2007) and Young (2003), the routine of calculating initial capital stock  $K_0$  is  $I_0/(\delta + g)$ , Here, I use the initial investment in 1978 as  $I_0$ , because complete investment series before 1978 are not available for most municipalities; Provincial 50 years' statistics only reported investment data in 1952, 1962, 1970 and 1975, which make imputing initial capital from 1952 inaccurate.  $\delta$  is the depreciation rate set at 0.06,  $g$  is average geometric growth rate of investment



between 1950s and 1978 for municipalities whose pre-1978 investment data are available, or the average geometric growth rate of investment between 1978 and 1980 for municipalities whose pre-1978 investment data are not available. Based on initial capital stock, investment series and GDP deflator, I get real capital stock in later years  $K_t$  using  $K_t = K_{t-1} * (1 - \text{delta}) + I_t / \text{deflator}$ .

### 3. Labor and Human Capital

Labor ( $L$ ): employment in the municipality, including corporate and non-corporate sector.

Human capital ( $H$ ): Based on the Chinese Population Census 1982 and Young (2003), since the 1982 population census did not include municipal educational attainment statistics, I use provincial average years of schooling as proxy for municipal educational attainment. Following Hall and Jones (1999), this is turned into a measure of human capital in 1982 through the formula:

$$h = e^{\varphi(s)}$$

where  $s$  is average years of schooling, and the function.

$\varphi(s)$  is piecewise linear with slope 0.134 for  $s \leq 4$ , 0.101 for  $4 < s \leq 8$ , and 0.068 for  $8 < s$ . The rationale for this functional form is as follows: given our production function, perfect competition in factor and good markets implies that the wage of a worker with  $s$  years of education is proportional to his human capital. Since the wage-schooling relationship is widely thought to be log-linear, this calls for a log-linear relation between  $h$  and  $s$  as well, or something like  $h = e^{\varphi * s}$ . Based on population census and survey 1982, 1990, 1995, Young (2003) has estimated China's average LN human capital growth rate to be 0.011 from 1978-1995. I combine human capital in 1982 (based on population census 1982) and this growth rate to generate human capital series for all municipalities.

### 4. Labor and Capital share<sup>37</sup>

The most disaggregated GDP data Chinese official statistics provided using income approach is at the provincial level. There are four components including Compensation of Employees, Net Taxes on Production, Depreciation of Fixed Assets and Net Operating Surplus. I can directly measure  $\alpha$  from the data, but I need to make some adjustments. I define the labor income share as unambiguous labor income divided by GDP net of the ambiguous categories (indirect taxes).

$$\text{Labor Share} = \frac{\text{Compensation of Employees}}{\text{GDP} - \text{Net Indirect Taxes}}$$

This procedure is equivalent to splitting the ambiguous categories between labor income and capital income in the same proportions as in the rest of the economy.

<sup>37</sup> Refer to The Great Depressions of the Twentieth Century and Holz (2006).

The capital share,  $\alpha$ , is then 1 - Labor Share. Since the income approach reports provincial statistics from 1978, I use the provincial capital share between 1978 and 2003 to be the capital share. I omit 2004 as there is a big change in the statistics on compensation of employees since 2004.

## 2 Fiscal Incentive: Testing For China's Sub-national Governments

### 2.1 Introduction

In the presence of asymmetric information, contracts in organizations, such as firms and political institutions, are designed to provide incentives. In recent years, contract design and the impact of incentives have been analyzed extensively. While there are many empirical studies focused on compensation schemes at the firm level (Bandiera, 2006) and theoretical research about incentive scheme in public organizations (Besley and Ghatak, 2005), fewer empirical studies are about the government.

The purpose of this paper is to study the fiscal compensation scheme between China's sub-national governments and national government. It evaluates the effects of fiscal incentives on local government's fiscal effort and sheds light on how government agencies react to incentives under a multi-tasking framework.

To this purpose, I collected a data set that covers twenty-nine provinces from 1980 to 2005. It contains indices on several budgetary taxes, extra-budgetary revenue, local budgetary expenditure, local extra-budgetary expenditure, information on fiscal incentive, namely, the marginal sharing rate (the proportion of fiscal revenue local governments could keep), as well as fiscal capacity indicators.

Contract theory predicts that in general, if the agent faces two tasks, the optimal effort on each task will depend on the sharing rates of both tasks. Changing one task's marginal sharing rate will cause changes to the productivity of both tasks.

From 1980 to 1993, China implemented a fiscal contracting regime. Sub-national governments signed fiscal contracts with national government, in which they agreed on a local marginal sharing rate<sup>38</sup>. Marginal sharing rates on budgetary revenue during this period exhibited cross province variations: while fourteen provinces had a sharing rate smaller than 100%, the other fifteen provinces had a sharing rate equal to 100%. In addition to budgetary tax revenue, there is an extra-budgetary revenue that have been allowed to set aside since the early 1980s<sup>39</sup>. Fees represent the main source for the extra-budgetary revenue at the local level. Because the extra-budgetary revenue is largely outside of the Ministry of Finance purview, it conferred significant autonomy to local governments, implicitly a 100% local sharing rate. In 1994, China's national

<sup>38</sup>From 1985 to 1993, the local marginal sharing rate is applied to all industrial-commercial taxes, for example, value-added tax, business tax, enterprise income tax that were mainly discussed in this paper.

<sup>39</sup>Fees represent the main source for extra-budgetary revenue at the local level. The list of fees includes surcharges on household utility bills, hospitals and school charges, road maintenance, advertising, vehicle purchasing and so on. Some of the fees are levied by individual departments of the local administration and kept for the departments' use without passing through the local general budget.

government abolished the fiscal contracting regime and initiated a new one called the tax separating system. Taxes are classified as local exclusive tax, central exclusive tax and shared tax. Therefore, the local sharing rates for different taxes were changed. In detail, local marginal sharing rates for value added tax, one of the most important taxes in China, decreased to 25% in all provinces; marginal sharing rates for business tax and enterprise income tax were set at 100% in all provinces. Therefore, provinces with pre-1994 marginal sharing rate less than 100% enjoyed a larger rise in the sharing rate for business tax and enterprise income tax, and a smaller fall in the sharing rate for value added tax. Provinces with pre-1994 marginal sharing rate equal to 100% had no increase in the sharing rate for business tax and enterprise income tax, and experienced a larger fall in the sharing rate for value added tax. Along with the changes in tax assignments, a major effort was made by the central government to establish its own revenue collection agencies - state tax bureaus responsible for collecting central and shared taxes. Local tax bureaus are responsible for collecting only local taxes.

My identification strategy combines the introduction of this reform with the cross-province differences in pre-reform budgetary sharing rates. Provinces with initially lower sharing rates had more to gain from the newly established fiscal regime in the budgetary category, whereas provinces with initially higher rates had more to lose. This heterogeneity allows for a treatment/control strategy. Moreover, the 1994 tax separating reform - which was fully implemented - did not depend on the factors at the provincial level. The goal in implementing this reform was to set marginal tax sharing rates across provinces at uniform levels<sup>40</sup>. I argue that it was not related to, or somehow catered to, special interest groups, and therefore should not be thought of as endogenous in this context.

After the reform, on one hand, in the budgetary category, business tax revenue, enterprise income tax revenue and value added tax revenue, all in per capita terms, increased markedly in provinces that previously had lower marginal sharing rates. This is true in absolute terms as well as relative to provinces that had higher marginal sharing rates. On the other hand, in the extra-budgetary revenue category, provinces with lower pre-1994 budgetary sharing rates devote less effort to extra-budgetary revenue after the reform, relative to provinces with higher pre-1994 marginal sharing rates. The results suggest that local governments treat the budgetary tax revenue and extra-budgetary revenue as substitutes. When the marginal sharing rate of budgetary category increases, local governments will increase their effort in budgetary revenue and decrease their effort in extra-budgetary revenue. The effort includes promoting the growth of fiscal revenue bases (Jin, Qian and Weingast, 2005; Cai and Treisman, 2006; Kung, Xu and Zhou, 2009) and better enforcement (Ma and Norregaard, 1998; Cai and Treisman, 2004). Despite the tax policy in China is such that the statutory tax rates and bases are set by the central government, local governments have influence or even

<sup>40</sup>In Jin et al. (2005) p1724, "the post-1994 phase has eliminated the variations of the revenue sharing rules from the 1980-1993 phase".

direct control rights over a substantial amount of resources within their jurisdiction, including regional firms, land, financial resources, energy, raw materials, and others (Xu, 2010). Being deeply involved in the regional economies, local governments could therefore effectively influence the tax revenue not only through better enforcement (by local tax officials to tackle tax evasion), but also through promoting the growth of tax bases. Therefore, in later empirical exercise, tax-rate and tax-base measures are not controlled for and should be included in the estimated effect.

A big concern about my empirical strategy is the non-random pre-reform marginal sharing rates. It is true that the particularistic contracted sharing rates before 1994 across provinces are not exogenous. Generally, richer coastal provinces were offered lower marginal sharing rates. In later regressions, I include per capita GDP, the number of special economic zones and per capita loans of financial institutions to take care of the possibility that provinces with lower pre-reform marginal sharing rates generate more budgetary revenue after the reform just because they are richer, or because their sectoral composition is more business friendly to generate tax, or because their financial development is easier to observe business transactions and thus to collect taxes. These control variables prevent my result from being driven by fiscal capacity, sectoral structure or financial development rather than more tax effort.

My analysis demonstrates the importance of taking cross-task substitution<sup>41</sup> into account when estimating the impact of policy reforms, such as the 1994 tax separating reform, that alter the structure of intergovernmental fiscal relations. The analysis provides a strong implication that the impacts of such reforms are not limited only to the task to which they are directly addressed: their effects may spill over to other tasks of sub-national governments.

There are of course disadvantages regarding my estimates, in particular, for value added tax. Since the 1994 reform did more than changing sharing rates. In particular, as local sharing rate for VAT was reduced, provincial governments also lost the authority to collect VAT themselves. A new State Tax Bureau was established to collect central and shared taxes. It suggests that the central government was aware of the potential agency problem, and thus questions the interpretation of the estimates as measuring the pure effect of marginal incentives on local effort. This is because the reform changed the basic structure of the agency problem, and essentially tried to remove the agency aspect of the revenue collection that experienced a lower pre-existing local sharing rate. Even if the changed collection system is uniformly implemented, the establishment of central collection agencies (State Tax Bureaus) may have heterogeneous effects across provinces depending on their pre-reform sharing rates. *Ceteris paribus*, this part of the reform is likely to increase revenue in the group of provinces with low initial sharing rates (and hence poor collection incentives) relative to the

<sup>41</sup>Not unlike my analysis of the effect of the Chinese tax separating reform on the revenue shares of different taxes, Marton and Wildasin (2007) examined the cross-program substitution effect of the 1996 welfare reform on the budget shares of Medicaid and welfare spending in US with a theoretical model. However, their analysis focused on the theoretical aspect.

provinces with high initial sharing rates (and hence strong collection incentives). Due to the feature of the reform, the interpretation of the coefficient of VAT may include 1) the effect of the newly established State Tax Bureau; 2) the effect of the sharing rate change on local effort to promote relevant tax base.

The incentives in China's sub-national governments have been discussed mainly in two strands of literature. One concerns how political incentive induces provincial leaders to promote economic performance (Li (1998), Qian and Xu (1999), Qian, Roland and Xu (2006), Li and Zhou (2004)). The other line looks at the relationship between fiscal incentive and economic development such as Zhang and Zou (1998), Zhang and Gong (2005), Lin and Liu (2000), Jin and Qian (2005), Yao (2005)<sup>42</sup>. Their work tried to argue that a higher local stake in fiscal revenue motivated local governments to promote economic growth. However, the identification strategies are exposed to the endogeneity problem as many factors contribute to economic growth in addition to the fiscal issue. It is very likely that the fiscal incentive captures the effect of other reform measures. Kung et al. (2009) moved a step further by investigating the link between the powerful fiscal incentive change and local government's behavior of promoting relevant tax bases<sup>43</sup>. However, as discussed above, no paper has yet investigated local government's effort in the budgetary and extra-budgetary revenue corresponding to the fiscal incentive. My work is the first trial to explore this aspect, with a stronger identification strategy in the sense that the link between the marginal sharing rate local governments faced and the fiscal revenue they generated is more robust.

The remainder of the paper is organized as follows: Section 2.2 briefly reviews the fiscal reform; Section 2.3 provides a simple theoretical model that generates predictions for the effects of marginal sharing rates change on local government's budgetary tax effort and extra-budgetary revenue effort; Section 2.4 describes the data and identification strategy; Section 2.5 illustrates the analysis of the budgetary category; Section 2.6 presents the extra-budgetary category; Section 2.7 concludes.

<sup>42</sup>Zhang and Zou (1998), using provincial panel data from 1980 to 1993, suggest that during the fiscal contracting period, fiscal decentralization denoted as the increasing trend in the ratio of local expenditure to central expenditure, has negative effect on growth. Zhang and Gong (2005) follow a similar procedure, extending the time series to include the 1994 tax separating reform. They get consistent results that fiscal decentralization between 1985 and 1993 is negatively correlated with growth while fiscal decentralization between 1994 and 2004 is positively correlated with growth. The problem with their work is the endogeneity of fiscal incentive index, as it is highly correlated with provincial characteristics. Lin and Liu (2000) used marginal sharing rate as the indicator for fiscal incentive, and obtained a positive result of fiscal decentralization on growth. Jin and Qian (2005) explored the 1985-1993 fiscal contracting reform in more detail and also got a positive relationship between fiscal incentive and regional economic development. Yao (2005) discussed local fiscal incentive within the inter-government grant framework. He argued that the current grant system has highly equalizing effect towards poor areas; also, his results reveal an economically significant crowding-out effect of equalization grants, indicating that the grant seeking incentives, which reduce local revenues, can undermine the economic efficiency of current grant policies.

<sup>43</sup>Kung et al (2009) argued that fiscal stimulus throughout 1994 tax separating reform induced local governments to switch their development focus from industrializing their jurisdictions to urbanizing them, as articulated in the eventual demise of Town and Village Enterprises after its phenomenal rise, followed by the boom (and recently bust) of a real estate sector in recent years.

## 2.2 Fiscal Reform Review

China's administrative system has five hierarchical levels of government: (1) central; (2) provincial; (3) municipal; (4) county and (5) township (Figure 2.1). In this paper I focus on the provincial level. It is the exact level where the 1994 fiscal reform was carried out and the identification variations come from. With respect to the tax practices in China, the central government determines the statutory rates and bases, but tax collection and significant spending are performed at the provincial and lower level. Moreover, local governments deeply participate into the regional economies and have enough resources to influence the fiscal revenue not only through enforcement (by local tax officials to tackle tax evasion), but also via promoting the growth of tax bases.

### 2.2.1 1980-1993 Fiscal Contracting Stage

In the early 1980s<sup>44</sup>, China began its so-called transitional period. It changed its price system to dual-track, i.e. market price and planned price coexisted at the same time, as well as initiated modest reform in state-owned enterprises (SOE) by introducing management and payment incentives. These reforms diluted the central government's monitoring ability over local governments' tax collection effort, as the real economy became more complicated than the purely central planned regime. Therefore, the central government decided to endow more fiscal power to local governments, in order to encourage them to cooperate with ongoing reforms and collect more taxes. In 1982, China started its fiscal contracting trial. The budgetary fiscal revenue is classified as central fixed, local fixed and adjustable income<sup>45</sup>. Local governments are allowed to keep part of the local revenue (local fixed and adjustable income). It was considered as a big movement compared to the former centralized fiscal system. However, the local revenue was small compared with central revenue part. Also, the initial trial was short-lived and changed frequently across the year. Actually, the system has become more favorable and stable for local governments since 1985 with local governments enjoying higher marginal sharing rates and also a larger local revenue base<sup>46</sup>. From 1985 to 1987, and 1988 to 1993, long term fiscal contracts were reached between the central and local governments. Many provinces (fifteen out of twenty-nine in the sample),

<sup>44</sup>Before the 1980s, China's fiscal system was highly centralized. Local governments acted as the collecting and spending agents for the central government. All revenue and expenditure were allocated by the central government, according to its fiscal year plan. Thus, the highly redistributed system was described vividly as "eating from the same stove" (Da Guo Fan). This unitary fiscal system relied heavily on China's whole economic system. During that time, China's national economy was dominated by state owned enterprises (SOE). Tax revenue was highly concentrated in the SOE sector guaranteed by the planned price system. This made taxes easy to collect and local tax efforts easy to monitor. As a result, the fiscal system functioned well before 1980s.

<sup>45</sup>For detailed revenue assignment and sharing rule details, refer to Appendix A and B.

<sup>46</sup>The fiscal contracts provided strong incentives for local governments to develop the non-state sector, of which township and village enterprises was a key component (Qian and Xu, 1993; Jin, Qian and Weingast, 2005). Since the mid-1980s, TVEs had been the main contributor to local taxes (mainly VAT) on which they enjoy high marginal sharing rates (Wong and Bird 2008).

generally inland poorer ones, enjoyed a 100% marginal sharing rate in major taxes such as value added tax, a turnover tax on the production of goods; business tax, a turnover tax covering most services; and enterprise income tax applied to businesses<sup>47</sup>. Other provinces, mainly rich coastal ones, had marginal sharing rates less than 100%. In Figure 2.2, light-shaded areas are provinces with pre-1994 100% marginal sharing rates; grey-shaded areas are provinces with pre-1994 lower marginal sharing rates.

For local governments, in addition to budgetary revenue, there is an extra-budgetary revenue that they were allowed to set aside since the early 1980s. Fees represent the main source for the extra-budgetary revenue at the local level. The list of fees includes surcharges on household utility bills, hospitals and school charges, road maintenance, advertising, vehicle purchasing and so on. Because the extra-budgetary revenue is largely outside of the MOF (the Ministry of Finance) purview, it conferred very significant real autonomy to local governments, implicitly 100% local sharing rate, and provides a local revenue base. Most importantly, it was widely accepted as a legitimate source for “topping up” local public expenditures<sup>48</sup>.

### 2.2.2 1994-2004 Tax Separating System

As local governments got a significant amount of fiscal revenue via fiscal contracting, the central government lost its dominant control over the whole fiscal system. According to National Statistical Bureau (1999), the ratio of central budgetary/total budgetary revenue declined to 22% by 1993. Some serious distortions occurred due to increasing fiscal incentives, such as local protectionism, local collusion with enterprises in tax evasion, increasing regional disparity and expanding extra-budgetary revenue. The Ministry of Finance decided to adopt a tax separating system in 1994 to strengthen the central government's control over the fiscal regime. It reversed the situation between central and local government in two aspects.

Firstly, Revenue assignment between the central and local governments. The fiscal contracting system was abolished. Fiscal revenue was reclassified as central exclusive tax (local sharing rate 0%), local exclusive tax (local sharing rate 100%), and shared tax (local sharing rate between 0% and 100%). The central government created a new consumption tax (central sharing rate 100%) and also adjusted the share over several important tax categories. For example, the local sharing rate of VAT (value added tax), the major tax in China, decreased to 25% for all provinces after the reform. As a compensation for the loss in VAT, the local sharing rate of business tax and enterprise

<sup>47</sup>Enterprise income tax for local governments is from locally owned SOEs, collective enterprises.

<sup>48</sup>Due to the increasing size in extra budgetary revenue which is outside the central regulation, in 1993, the central government cut the items listed as extra-budgetary revenue. Reform of extra-budgetary funds again had begun in 1996 and intensified in 1998 and 1999. Since 1998, the MOF has continued a policy of converting fees into taxes with the objective of reducing the importance of extra-budgetary funds at the local level. In 1999, the MOF began to formulate organizational budgets that show all budgetary, extra-budgetary and other resources and spending for each ministry. In 2000, the Minister of Finance, Xiang Huaicheng, announced plans for treasury reform to improve the financial management of public funds, and introduction of new standards for government procurement.



income tax was set to be 100% in all provinces.

Secondly, Tax administration. The 1994 reform established a national tax administration in China for the first time. The previous local tax bureaus were split into two distinct offices: state tax bureaus responsible for collecting central and shared taxes, and local tax bureaus responsible for collecting local taxes.

Because of the newly adopted tax separating system<sup>49</sup>, the central share of total budgetary revenue increased to around 55% in 1994 (National statistical Bureau, 2004). However, local governments continue to use extra-budgetary revenue as a way to avoid central government restriction on the use of these funds. Essentially, local sharing rate of extra-budgetary revenue is still 100%.

To sum up, between 1985 and 1993, budgetary sharing rates exhibited cross-province variations. Fourteen provinces<sup>50</sup>, had average marginal sharing rates less than 100%; the other fifteen provinces<sup>51</sup> all had 100% marginal sharing rates. In the 1994 reform, for value added tax, these fourteen provinces had a smaller drop in the marginal sharing rate compared to the other fifteen provinces, who had decreased from 100% pre-1994 to 25%. For business tax and enterprise income tax, these fourteen provinces had a larger increase in the marginal sharing rate, compared to the fifteen provinces which already enjoyed a 100% sharing rate pre-1994. Overall, through the 1994 tax separating reform, the provinces with lower pre-94 budgetary sharing rate gained more and lost less in budgetary category compared to those with higher pre-existing budgetary rates. Appendix D provides profiles for the local marginal sharing rate of value added tax, business tax, enterprise income tax and extra-budgetary revenue from 1985 to 2004.

### 2.3 Fiscal Incentive and Effort: A Theoretical Model

The relationship between Chinese central government and local governments could be depicted by a classical principal-agent model. Local governments are offered a certain share of their output (fiscal revenue in this case). Such performance related pay aligns the agent's (local government) interests with the principal's (the central government). China's local governments have higher incentives to generate more revenue if they are offered more, as they could spend more in local expenditures. The more they spend, especially in capital constructions like infrastructure investment, the more growth they could inspire and the better political career the provincial leaders could

<sup>49</sup>The tax separating system cut incentives for promoting local industry especially TVEs by reducing local 'ownership' of VAT (Kung, Xu and Zhou, 2009). However, there is significant increase in business tax receipts, which partly reflects the incentive of local governments to promote the service sector, as the proceeds of this tax have accrued 100 percent to local governments since 1994. Also, the separation of administration of central and local taxes greatly stimulated the enthusiasm of local governments to collect revenues.

<sup>50</sup>In detail, they are Anhui, Beijing, Hebei, Henan, Hubei, Hunan, Jiangsu, Liaoning, Shandong, Shanghai, Shanxi, Sichuan, Tianjin, Zhejiang.

<sup>51</sup>In detail, they are Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Heilongjiang, Inner Mongolia, Jiangxi, Jilin, Ningxia, Qinghai, Shaanxi, Xinjiang, Yunnan.

enjoy (Xu 2009). Therefore, the higher marginal sharing rate offered to provincial governments is mapped into the higher utility provincial politicians get.

Suppose the local government has two tasks, also assume that the local government is maximizing the following objective function.

$$\max_{e_1, e_2} \sum_{i=1}^{n=2} S_i R_i(e_i) - C_1(e_1, e_2) - C_2(e_1, e_2) + T$$

where  $S_i$  is the local marginal sharing rate on task  $i$ ,  $i = 1, 2$ ;  $e_1$  and  $e_2$  are local efforts including enforcement and promoting the growth of relevant tax base on task 1 and 2;  $R_1(e_1)$  and  $R_2(e_2)$  are fiscal revenue from task 1 and 2;  $C_1(e_1, e_2)$  and  $C_2(e_1, e_2)$  are cost functions for task 1 and 2;  $T$  is net lump sum transfer from the central government. For simplicity, further assume that

$$R_1(e_1) = e_1$$

$$R_2(e_2) = e_2$$

$$C_1(e_1, e_2) = \frac{1}{2}e_1^2 + \frac{1}{2}\gamma e_1 e_2$$

$$C_2(e_1, e_2) = \frac{1}{2}e_2^2 + \frac{1}{2}\gamma e_1 e_2$$

where  $\gamma$  describes the relationship between task 1 and task 2,  $0 < \gamma < 1$  being substitutes. Optimal efforts could be found by FOC:

$$e_1^* = \frac{s_1 - \gamma s_2}{1 - \gamma^2}; \quad e_2^* = \frac{s_2 - \gamma s_1}{1 - \gamma^2}$$

**Proposition 1** *If task 1 and 2 are substitutes ( $0 < \gamma < 1$ ), given  $s_2$  constant, when the marginal sharing rate of task 1,  $s_1$ , increases, the agent's effort on task 1,  $e_1$  will increase, while the effort on task 2,  $e_2$  will decrease; when the marginal sharing rate of task 1,  $s_1$ , decreases, the agent's effort on task 1,  $e_1$  will decrease, while the effort on task 2,  $e_2$  will increase.*

Therefore, with regard to China's tax separating reform in 1994, I have the following prediction: provinces with a lower pre-1994 sharing rate of budgetary revenue (mainly composed of tax revenue such as value added tax, business tax and enterprise income tax) had a larger increase in the sharing rate, and thus had a relatively bigger increase in the budgetary revenue, compared to those with a higher marginal sharing rate pre-reform; also, they had a relatively larger decrease in the extra-budgetary revenue after 1994.

## 2.4 Data and Identification Strategy

### 2.4.1 Data

In this paper, I use panel data for twenty-nine provinces from 1980 to 2005. Tibet is dropped from the dataset due to the poor quality of its fiscal data<sup>52</sup>. Chongqing, a newly established municipal city since 1997, is not included in the dataset, as it did not go through the 1994 tax separating reform<sup>53</sup>. In my paper, I use the marginal sharing rate of budgetary taxes<sup>54</sup> as the index for fiscal incentive.

Variables that would be used in the regression are classified as follows:

- I. Local tax revenue indices<sup>55</sup> including value added tax, business tax and enterprise income tax;
- II. Local extra-budgetary revenue;
- III. Local budgetary expenditure and extra-budgetary expenditure;
- IV. Local fiscal incentive indices including marginal sharing rates of value added tax, business tax and enterprise income tax;
- V. Local economic control variables including GDP, State-level Economic Zones and loans of financial institutions;
- VI. Local political control variable: political ties with the central government.

### 2.4.2 Identification Strategy

The first factor for identifying the impact of the 1994 tax separating reform is that different provinces have distinct pre-1994 budgetary sharing rates. All twenty-nine provinces experienced this reform. Using the marginal sharing rates at the provincial level in a regression yields the following formulas:

$$Y_{it} = 1 \times \text{pre1994 sharing rate}_{it} - 25\%$$

$$Z_{it} = -1 \times \text{pre1994 sharing rate}_{it} + 100\%$$

<sup>52</sup>In some years, the tax revenue is negative. In some years, data are missing.

<sup>53</sup>The fiscal statistics for Sichuan before 1997 have excluded Chongqing. So, data are comparable before and after 1997.

<sup>54</sup>In China's fiscal reform literature, there are mainly two kinds of fiscal incentive indices. One is marginal sharing rate, by Lin and Liu (2000), Jin and Qian (2005), which describes local reward for their efforts at the margin, while the other is the ratio of local expenditure/central expenditure in a province, by Zhang and Zou (1998), Gong and Zhang (2005). They argued that this ratio, commonly used in the literature on fiscal federalism, captured well the magnitude of fiscal decentralization, thus was an appropriate index for fiscal incentive. However, China's statistical data does not provide central expenditure at the provincial level. Instead, what they have is only central expenditure in the national level. Then, for the same year, given same denominator, the higher local expenditure, the higher the ratio, and therefore the higher the fiscal incentive in a province. The ratio is very likely to be endogenous, as local expenditure is highly correlated with other local characteristics, such as GDP, population, etc. Provinces like Beijing, Jiangsu, Zhejiang have much higher expenditures than provinces like Ningxia, Xinjiang. But on margins, they are only allowed to keep part of local revenue for their tax effort, while the latter ones could keep 100%.

<sup>55</sup>The original statistics of value-added tax revenue since 1994 and enterprise income tax revenue since 2002 do not take into account the part handing over to the central government. For my use, I have transformed them into total tax revenue generated in every province. I discuss data processing procedure in more detail in Appendix C.

where  $Y_{it}$  is the decrease in the marginal sharing rate of value added tax;

$Z_{it}$  is the increase in the marginal sharing rate of business tax and enterprise income tax.

Broadly, this means that the provinces with low (pre-existing) sharing rates were in a position to benefit more from the newly established fiscal regime, whereas areas with high prevalence were not. This heterogeneity allows for a treatment-control strategy. Secondly, the initiation of the 1994 reform was largely a function of factors external to the province. It imposes homogenous marginal sharing rates for all sub-national governments, as well as establishing the State Tax bureau and the Local Tax Bureau in all provinces. This contrasts with explanations that might have troublesome endogeneity problems, such as capture by special interests.

These factors combine to form the central variable in the present study:

$$sharing\ rate_i^{pre} \times post94_t$$

where  $i$  indicates the province.  $sharing\ rate_i^{pre}$  denotes the average level of the marginal sharing rate in province  $i$  before the reform,  $post94_t$  is a dummy variable indicating whether year  $t$  is after the 1994 tax separating reform. I compare the evolution of outcomes (tax revenue per capita) across provinces with distinct pre-reform marginal sharing rates, in order to assess the effect of the reform to the remarkable changes.

A big concern about my identification validity is the non-random pre-reform marginal sharing rates. It is true that the particularistic contracted sharing rates before 1994 across provinces are not exogenous. Generally, richer coastal provinces were offered lower marginal sharing rates. Using the interaction term  $sharing\ rate_i^{pre} \times post94_t$ , I allow a break from 1994, as there is no obvious reason to justify why we observe the revenue to increase more in richer provinces immediately after 1994 except for the different change in marginal sharing rates. More importantly, in later regressions, I also include per capita GDP<sup>56</sup>, the number of state-level special economic zones and per capita loans of financial institutions to take care of the possibility that provinces with lower pre-reform marginal sharing rates generate more budgetary revenue after the reform just because they are richer, or because their sectoral composition is more business friendly to generate tax revenue, or because their financial development is easier to observe business transactions and thus to collect taxes. Since the tax revenue is in fact partly driven by provincial governments' effort to promote the growth of relevant tax bases<sup>57</sup> under the Chinese fiscal system, the tax base is not controlled for in the regressions and should therefore be included in the estimated effect.

<sup>56</sup>I did not put per capita tax base as control variable for the reason that tax base would be highly endogenized with respect to marginal sharing rate.

<sup>57</sup>The unique ability of Chinese local governments to promote the growth of tax bases despite the fact that they do not have tax autonomy (setting statutory rates and bases is the authority of the central government) is documented in a large literature, including Qian and Xu, 1993; Jin, Qian and Weingast, 2005; Cai and Treisman, 2006; Wong and Bird 2008; Kung, Xu and Zhou, 2009.

## 2.5 Budgetary Revenue

### 2.5.1 Difference in Difference Analysis

Without taking into account heterogeneous starting levels of provinces whose average pre-1994 marginal sharing rate was smaller than 100%, I first conduct a simple difference in difference analysis.

I split twenty-nine provinces in the sample into two groups according to their pre-1994 marginal sharing rate. Group A (pre-1994 sharing rate <100%) contains fourteen provinces. Group B (pre-1994 sharing rate =100%) contains fifteen provinces. I also divided the time series from 1985 to 2004<sup>58</sup> into two parts, one is from 1985 to 1993; the other is from 1994 to 2004, using 1994 as a threshold.

From Table 2.1, we can see Group A, which has a larger increase in the sharing rates of business tax and enterprise income tax, and a smaller decrease in the sharing rates of value added tax, indeed exhibits larger increase in tax revenue. It is consistent with section 2.3's predictions. From the graphs (Appendix E), similar results hold. In general, group A shows more increase than group B. Of course, without taking into account other province specific control variables, the analysis is rough. However, it does provide us with a preliminary idea that the 1994 reform has different effects on different groups.

### 2.5.2 Econometric Specification

In order to capture the effect of distinct pre-existing marginal sharing rates on tax effort after the 1994 reform, I use the following specifications<sup>59</sup>.

$$Tax_{it} = \alpha_i + \beta_t + \gamma(sharing\ rate_i^{pre} \times post94_t) + X'_{it}\delta + \varepsilon_{it} \quad (2.1)$$

Where  $Tax_{it}$  are log of various tax revenue in province  $i$  at time  $t$ .

There are three tax indices I used

- 1) per capita value added tax;
- 2) per capita business tax;
- 3) per capita enterprise income tax.

$\alpha_i$  is the province fixed effect, which controls for the influence of unobserved time-invariant province characteristics (e.g. location, natural endowment) on tax revenue.  $\beta_t$  will capture the effects of national events which affect all provinces in a similar manner. It is the strongest specification in terms of time variable; however, it does not allow me to identify the 1994 reform's level effect clearly.  $sharing\ rate_i^{pre}$  is the weighted average of the sharing rates prevailing pre-1994 in province  $i$ .  $post94_t$  is the year dummy which denotes the 1994 reform. It switches from 0 to 1 for all provinces

<sup>58</sup>For budgetary tax revenue, well kept data starts from 1985.

<sup>59</sup>The specification is similar to Bleakley, H.(2006) as well as Edmonds et al (2008). I did not put  $sharing\ rate_i^{pre}$  as an indicator in regression as it is correlated with province fixed effect.

since 1994.  $X_{it}$  contain control variables, i.e. per capita GDP, which captures the fiscal capacity in province  $i$  at year  $t$ .  $\varepsilon_{it}$  is the provincial error term. The coefficient of the interaction term ( $sharing\ rate_i^{pre} \times post94_t$ ),  $\gamma$ , will capture the effect of the pre-reform budgetary sharing rate level on the after reform tax output.

$$\begin{aligned} Tax_{it} = & \alpha_i + \theta \times post94_t + \beta \times trend_t + \phi(post94_t \times trend_t) \\ & + \gamma(sharing\ rate_i^{pre} \times post94_t) + X'_{it}\delta + \varepsilon_{it} \end{aligned} \quad (2.2)$$

Compared with equation (2.1), the difference in specification mainly comes from the time variable. In equation (2.2), I specify  $trend_t$  as the existing time trend. In this setting, the coefficient of the reform dummy,  $\theta$ , will capture the level effect of the 1994 reform over and above the existing trend. The coefficient of the time,  $\beta$ , will capture the trend since 1985 if there is any. The coefficient of the interaction term  $post94_t \times trend_t$ ,  $\phi$ , will capture the effect of the 1994 reform on the change of the trend if there is any. The coefficient,  $\gamma$ , will capture the effect of the pre-reform sharing rate level on the after reform tax output.

In addition to the endogeneity problem, there are two issues that might bias our results. One is that poorer provinces might have had more transfers from the central government since 1994 (a main reason the central government persuaded local governments to implement the 1994 reform), which might discourage their collection effort. Equivalently, the responses I get might be to the transfer policy rather than the change of budgetary sharing rates. However, according to Zhang and Martinez (2003), from 1994 to 2000, the equalization grant to poorer provinces was around 10% out of total transfers from the central government to local governments. Therefore, this concern would not bias the regression results significantly.

The other concern is that in addition to the tax sharing rate change, the collecting system also changed. Local exclusive taxes including business tax and enterprise income tax are collected by local tax bureaus, which are essentially under the leadership of provincial governments. Here, the post-94 dummy will capture the common shock to all provinces, including the local tax bureau establishment which was the same across all provinces in 1994. As a result, the coefficient of the interaction term,  $sharing\ rate_i^{pre} \times post94_t$ , will provide us with clean effect of the 1994 rate change depending on a different pre-1994 marginal sharing rate level, for business tax and enterprise income tax. However, there are disadvantages regarding my estimates, in particular, for value added tax. Since the 1994 reform did more than changing sharing rates. As local sharing rate for VAT was reduced, provincial governments also lost the authority to collect VAT themselves. A new State Tax Bureau was established to collect central and shared taxes. It suggests that the central government was aware of the potential agency problem, and thus questions the interpretation of my estimates as measuring the pure effect of marginal incentives on local effort. This is because the reform changed the basic structure of the agency problem, and essentially tried to re-

move the agency aspect of the revenue collection that experienced a lower pre-existing local sharing rate. Even if the changed collection system is uniformly implemented, the establishment of central collection agencies (State Tax Bureaus) may have heterogeneous effects across provinces depending on their pre-reform sharing rates. *Ceteris paribus*, this part of the reform is likely to increase revenue in the group of provinces with low initial sharing rates (and hence poor collection incentives) relative to the provinces with high initial sharing rates (and hence strong collection incentives). Due to the combined features of the reform, the interpretation of the coefficient of VAT may include 1) the effect of the newly established State Tax Bureau; 2) the effect of the sharing rate change on local effect to promote relevant tax base.

### 2.5.3 Results

Table 2.2 reports the estimates of provincial per capita value added tax, business tax and enterprise income tax regression with respect to equation (2.1) and (2.2) respectively. In two specifications, the interaction term,  $sharing\ rate_i^{pre} \times post94_t$ , always has a significant and negative coefficient, which supports my hypothesis that provinces with a lower starting level benefited more in the 1994 reform, and thus exhibit higher tax effort on budgetary taxes afterwards. In detail, in per capita terms, for value added tax, in Columns (1) and (2) provinces with a 0% pre-1994 marginal sharing rate increase by 27% after 1994 compared to those with a 100% pre-reform sharing rate. For business tax, in Columns (3) and (4), provinces with a 0% pre-1994 marginal sharing rate increase by 30% after 1994 compared to provinces with a 100% pre-reform sharing rate. For enterprise income tax, in Column (5), provinces with a 0% pre-1994 marginal sharing rate increase by 32% after 1994 compared to provinces with a 100% pre-reform sharing rate.

The coefficients for the control variable, per capita GDP, are positive and highly significant, showing that provinces with higher fiscal capacity generate more tax revenue. In Columns (2), (4) and (6), the coefficients of  $post94_t \times trend_t$  are positive and significant, suggesting that the reform changed the trend of tax collection. The channel is likely to be through the establishment of the State Tax bureau and the Local Tax bureau, which have been in charge of collecting budgetary tax since 1994.

### 2.5.4 Robustness Check

**Additional Controls** Though in the previous regressions I use per capita GDP to control for the fiscal capacity of the province, there are still concerns that provinces with lower pre-existing sharing rates generate more tax revenue after 1994 because they are more business friendly or their financial development is better for tax bureaus to observe transactions and therefore collect revenues. To address these problems, I put the number of state-level special economic zones located in province  $i$  at  $t$  to capture whether the province's sectoral structure is more export-oriented and business

friendly<sup>60</sup>. Moreover, I put per capita loans by financial institutions to capture each province's financial development. These control variables prevent my result from being driven by sectoral structure and financial development rather than more tax effort.

In addition to potentially relevant economic characteristics that might influence fiscal revenue, we might worry that provincial leaders' political relationship with the central government were correlated with pre-1994 marginal sharing rates and therefore drive the pattern we observe. I therefore use provincial political ties by Shih, Victor (2004)<sup>61</sup> to deal with the concern.

In Table 2.3, the interaction term,  $sharing\ rate_i^{pre} \times post94_t$ , always has a significant and negative coefficient. Specifically, for value added tax, in Columns (1) and (2), provinces with a 0% pre-1994 marginal sharing rate increase by 23% after 1994 compared to provinces with a 100% pre-reform sharing rate. For business tax, in Columns (3) and (4), provinces with a 0% pre-1994 marginal sharing rate increase by 27% after 1994 compared to provinces with a 100% pre-reform sharing rate. For enterprise income tax, in Column (5), provinces with a 0% pre-1994 marginal sharing rate increase by 31% after 1994 compared to provinces with a 100% pre-reform sharing rate. The coefficients for the number of state-level special economic zones are positive and significant, showing that provinces which are more open to foreign business generate more tax revenue. The coefficients for per capita loans by financial institutions are positive and significant, suggesting that provinces with better financial development generate more tax revenue. The coefficients for political ties are negative and significant, suggesting that having a good relationship with the central government is an asset for the provincial level governments to perform relatively weaker in terms of tax revenue collection.

**Falsification Test** It is argued that the official classification of local revenue (thus, local marginal sharing rate) and central revenue might not matter too much de-facto in China, given the complicated inter-governmental transfer system. For example, Young (2000) shows the ratio of central expenditure to local expenditure is relatively stable before and after the 1994 reform, although the 1994 tax separating reform dramatically changed the ratio of central revenue to local revenue. It seems that the link between local revenue and local expenditure is not very tight in China. Therefore, the change in the local marginal sharing rates of tax revenue in the 1994 reform might just be a nominal event, which does not influence local behavior at all. Potentially local governments know that what is called local revenue is not strictly adhered to when it comes to expenditure. Then, it might be a counter fact to the incentive story I addressed in the paper that says the local marginal sharing rate does matter. As a result, I run regressions on local budgetary expenditure. The main idea in the

<sup>60</sup>Refer to Chapter 1's discussions about Special Economic Zones.

<sup>61</sup>Shih, Victor(2004): Database on Provincial Factional Affiliation with Standing Committee Members of the Chinese Communist Party: 1978-2004



robustness check is if local governments collect more when they were offered a higher share, it must be because they could spend more.

In Table 2.3, Columns (7) and (8), the interaction term,  $sharing\ rate_i^{pre} \times post94_t$ , always has a significant and negative coefficient, which suggests that provinces with a lower starting level experienced a larger increase in local expenditure after the 1994 reform. Column (7) suggests that local budgetary expenditure of provinces with a 0% pre-1994 marginal sharing rate increases by 38% after 1994 compared to provinces with a 100% pre-reform sharing rate. The coefficients for local control variable, per capita GDP, are positive and highly significant, showing that provinces with higher fiscal capacity get to spend more. The coefficients for local control variable, the number of state-level economic zones, are positive and significant, showing that provinces which are more open to foreign firms get to spend more. The coefficients for per capita loan are all positive and significant, suggesting that provinces with better financial development get to spend more. The coefficients for political ties are negative and significant, suggesting that having a good relationship with the central government is an asset for the provincial government to perform relatively weaker in terms of budgetary spending. Local expenditure does differ for two groups after the 1994 reform, suggesting that the local marginal sharing rates are credible. Provinces did face different incentives throughout the 1994 reform. If the 1994 reform induced local marginal sharing rate change is null, we should not observe significant differences in local expenditure.

## 2.6 Extra-budgetary Revenue

In the former sections, I have analyzed the 1994 reform's effects on different provinces in terms of their fiscal effort in budgetary taxes. In the following part, I will conduct analysis on provincial governments' effort in extra-budgetary revenue (Appendix E for detail), using the heterogeneity in pre-existing local budgetary sharing rates. The prediction should be, after 1994 (given the presence of nationwide uniform extra-budgetary reforms in 1993 and 1998), provinces with lower pre-existing budgetary sharing rates will devote less effort to extra-budgetary revenue, compared to those with higher pre-existing budgetary sharing rates, as they have benefited more from the 1994 tax separating reform in the budgetary category.

### 2.6.1 Econometric Specification

I use similar specifications as section 2.5.

$$PER_{it} = \alpha_i + \beta_t + \gamma(sharing\ rate_i^{pre} \times post94_t) + X'_{it}\delta + \varepsilon_{it} \quad (2.3)$$

The coefficient of interaction term,  $\gamma$ , will capture the effect of the pre-reform

budgetary sharing rate on the after reform extra-budgetary revenue.

$$\begin{aligned} PER_{it} = & \alpha_i + \theta \times post94_t + \beta \times trend_t + \phi [post94_t \times trend_t] \\ & + D93_t + D98_t + \gamma(sharing\ rate_i^{pre} \times post94_t) + X'_{it}\delta + \varepsilon_{it} \quad (2.4) \end{aligned}$$

The only difference between equation (2.4) and equation (2.2) comes from two dummies  $D93_t$  and  $D98_t$ , which are used to control for nationwide uniform extra-budgetary reforms in 1993 and 1998.

### 2.6.2 Results

In Table 2.4, Columns (1) and (2), the coefficients for  $sharing\ rate_i^{pre} \times post94_t$  are positive and significant, suggesting that provinces with lower pre-1994 budgetary sharing rates devoted less effort to extra-budgetary revenue after 1994. Particularly, per capita extra-budgetary revenue of provinces with a 0% pre-1994 budgetary sharing rate reduces by 55% after 1994 compared to provinces with a 100% pre-reform sharing rate. This is consistent with the results I found in the previous regression that the provinces with lower pre-1994 marginal sharing rates had more to gain in the budgetary sharing rates through the 1994 tax separating reform, compared to provinces with higher pre-1994 marginal sharing rates. The findings indicate the substitutability between the budgetary revenue and extra-budgetary revenue. The coefficients for local control variable, per capita GDP, are positive and highly significant, showing that provinces with higher fiscal capacity collect more extra-budgetary revenue.

### 2.6.3 Robustness Check

In Table 2.4, Columns (3) and (4), the coefficients for  $sharing\ rate_i^{pre} \times post94_t$  remain at similar levels. Coefficients for additional provincial economic characteristics including the number of state-level economic zones and per capita loans by financial institutions are positive and significant, showing that provinces which are more open to foreign business and have better financial development generate more extra-budgetary revenue. The coefficients for political ties are not significant, which suggest that having a good relationship with the central government is not influential for the extra-budgetary performance. Also, the interaction term,  $post94_t \times trend_t$ , has a negative coefficient. To recall from Table 2.3, the reform in 1994 increases the trend of tax collection as indicated by the positive coefficient of  $post94_t \times trend_t$ . The findings suggest provincial governments treat budgetary revenue and extra-budgetary revenue as substitutes.

Similar results should hold for the extra-budgetary category when it comes to the expenditure side. If local governments collect more extra-budgetary revenue, it has to be that they could spend more. In Columns (5) and (6), the coefficients for  $sharing\ rate_i^{pre} \times post94_t$  are positive and significant, suggesting that provinces with

higher pre-1994 budgetary sharing rates spent more after 1994. Specifically, Column (5) suggests that per capita extra-budgetary expenditure of provinces with a 100% pre-1994 budgetary sharing rate increased by 60% after 1994 compared to provinces with a 0% pre-reform sharing rate.

## 2.7 Conclusion

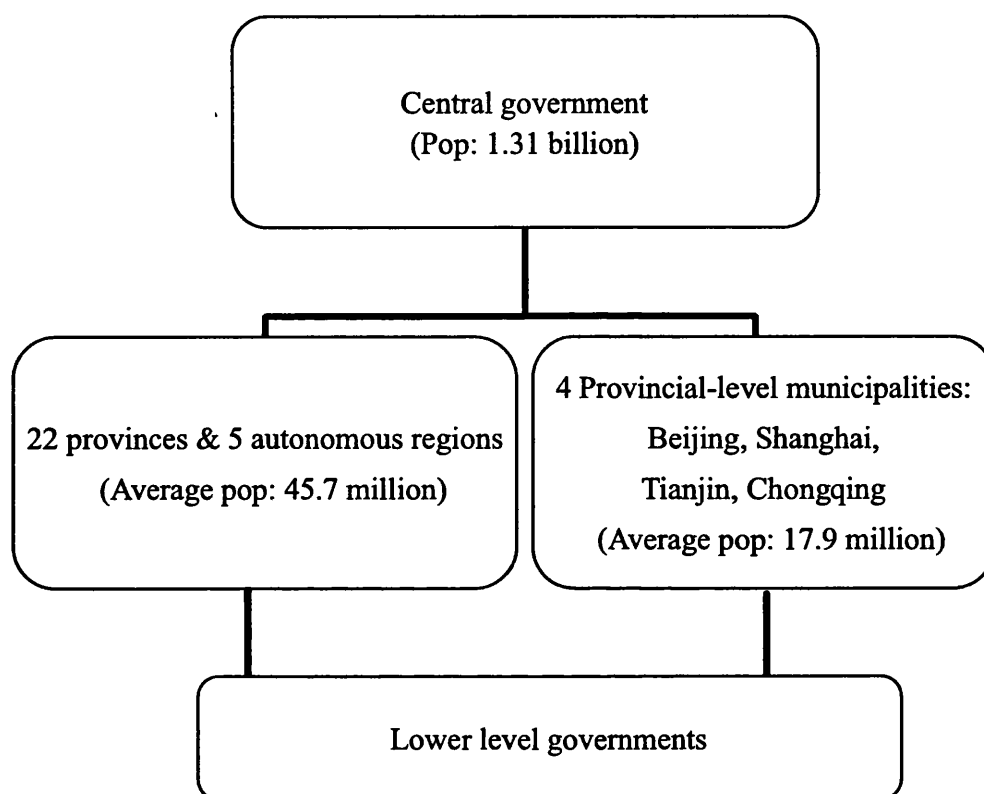
The question of how agencies react to incentive is one of the holy grails in contract theory. Empirical studies have been emerging rapidly in the last few decades on this issue. However, the way government institutions react to incentive is not widely explored.

This paper investigates whether the effect of the 1994 tax separating reform - whereby the marginal sharing rate for value added tax decreased to 25% in all provinces, and for business tax and enterprise income tax increased to 100% in all provinces - vary across Chinese provinces with different pre-reform marginal sharing rates. The results indicate that budgetary tax has risen more in provinces with a lower pre-reform sharing rate compared to those with a higher pre-reform sharing rate, while extra-budgetary revenue has increased less in provinces with a lower pre-reform sharing rate. My analysis suggests that local governments do respond to fiscal incentives in a way contract theory predicts, at least in China's case. Higher share of the output (fiscal revenue) does motivate bureaucrats. Moreover, the results in this paper indicate that a high marginal sharing rate is beneficial in the sense that it enhances tax effort and alleviate local pursuit of extra-budgetary revenue. Therefore, in order to achieve efficiency, a better way for China's central government seems to give local governments higher marginal sharing rates in budgetary taxes.

This study concentrated on estimating sub-national government's fiscal effort with respect to fiscal incentive. The sharp change in the marginal sharing rate of the taxes, however, may have had a broader impact on the Chinese economy, including the potential effect of enhancing the local incentive in promoting local growth. How did local governments adjust to such a shock in addition to fiscal revenue collection? Studying these additional effects will be the direction of my future work.

## 2.8 Figures and tables

Figure 2.1: Government Structure in China



Source: National Statistical Bureau 2006

**Figure 2.2:** Geographical Distributions of Provinces with Distinct Pre-existing Budgetary Marginal Sharing Rate



Notes: light-shaded areas are provinces with pre-1994 budgetary sharing rates=100%;  
grey-shaded areas are provinces with pre-1994 budgetary sharing rates<100%.

Table 2.1: Difference-in-Difference of Budgetary Tax Revenue

Unit: 10000RMB

Per Capita Value Added Tax	before 1994	after 1994	difference
pre1994<100%	0.0156 (0.0016)	0.0644 (0.0064)	0.0488*** (0.0080)
pre1994=100%	0.0073 (0.0003)	0.0287 (0.0014)	0.0214*** (0.0018)
difference	0.0082*** (0.0016)	0.0357*** (0.0064)	0.0274*** (0.0080)
Per Capita Business Tax	before 1994	after 1994	difference
pre1994<100%	0.0079 (0.0009)	0.0290 (0.0040)	0.0210*** (0.0047)
pre1994=100%	0.0041 (0.0003)	0.0112 (0.0007)	0.0071*** (0.0009)
difference	0.0038*** (0.0009)	0.0177*** (0.0039)	0.0139*** (0.0047)
Per Capita Enterprise Income Tax	before 1994	after 1994	difference
pre1994<100%	0.0062 (0.0008)	0.0223 (0.0039)	0.0161*** (0.0047)
pre1994=100%	0.0023 (0.0001)	0.0063 (0.0007)	0.0040*** (0.0008)
difference	0.0039*** (0.0008)	0.0161*** (0.0038)	0.0121*** (0.0046)

Notes: in the table, we classify 29 provinces into two groups: the one with pre1994 sharing rate <100% which contains 14 provinces; the other group with pre1994 sharing rate =100% which contains 15 provinces.

Table 2.2: Budgetary Category: Basic Specification

Dependent Variable	ln(per capita value added tax)		ln(per capita business tax)		ln(per capita enterprise income tax)	
	(1)	(2)	(3)	(4)	(5)	(6)
Preshare*post94	-0.237*** (0.090)	-0.244*** (0.092)	-0.258*** (0.073)	-0.261*** (0.075)	-0.278** (0.117)	-0.391*** (0.131)
post94		0.196 (0.132)		-0.573*** (0.105)		-3.006*** (0.187)
trend		0.0173 (0.014)		0.0344*** (0.011)		-0.185*** (0.019)
post94*trend		0.0209** (0.008)		0.0121* (0.006)		0.296*** (0.011)
Ln(per capita GDP)	0.665*** (0.094)	0.622*** (0.084)	0.844*** (0.075)	0.873*** (0.068)	1.451*** (0.118)	0.996*** (0.118)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	-	Yes	-	Yes	-
Observations	525	525	549	549	544	544
R square	0.964	0.961	0.974	0.972	0.945	0.929

Standard errors in parentheses: \* p<0.10, \*\* p<0.05, \*\*\* p<0.01. In the regressions, preshare denotes the average level of marginal sharing rate in each province before the reform; post94 is a dummy variable indicating whether it is after the 1994 tax separating reform. We use per capita GDP as an important variable to control for potential endogeneity regarding the pre1994 budgetary sharing rates.

Table 2.3: Budgetary Category: Robustness Check

Dependent variable	a. Robustness to controls						b. Falsification test	
	ln(per capita value added tax)		ln(per capita business tax)		ln(per capita enterprise income tax)		Ln(per capita budgetary expenditure)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
presharingrate*post94	-0.214** (0.090)	-0.211** (0.092)	-0.235*** (0.069)	-0.241*** (0.072)	-0.266** (0.111)	-0.345*** (0.127)	-0.321*** (0.040)	-0.343*** (0.044)
post94		0.217 (0.135)		-0.679*** (0.104)		-2.959*** (0.185)		-0.559*** (0.063)
trend		0.0303* (0.016)		0.012 (0.012)		-0.166*** (0.022)		0.020*** (0.007)
post94*trend		0.0213** (0.009)		0.023*** (0.006)		0.298*** (0.012)		0.081*** (0.004)
Ln(per capita GDP)	0.461*** (0.112)	0.448*** (0.097)	0.483*** (0.088)	0.630*** (0.078)	0.968*** (0.141)	0.494*** (0.136)	0.478*** (0.050)	0.374*** (0.047)
Economic zones	0.019*** (0.006)	0.022*** (0.005)	0.022*** (0.004)	0.013*** (0.004)	0.033*** (0.007)	0.046*** (0.007)	0.014*** (0.003)	0.015*** (0.002)
Ln(per capita loans)	0.033 (0.060)	-0.007 (0.059)	0.289*** (0.044)	0.277*** (0.045)	0.292*** (0.071)	0.163** (0.078)	0.148*** (0.026)	0.130*** (0.027)
political ties	-0.0166 (0.011)	-0.0105 (0.011)	-0.030*** (0.009)	-0.025*** (0.009)	-0.062*** (0.014)	-0.046*** (0.015)	-0.026*** (0.005)	-0.022*** (0.005)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	-	Yes	-	Yes	-	Yes	-
Observations	525	525	549	549	544	544	573	573
R square	0.964	0.962	0.977	0.975	0.951	0.936	0.991	0.99

Notes: standard errors in parentheses. \* p<0.10, \*\* p<0.05, \*\*\* p<0.01. In the regressions, preshare denotes the average level of marginal sharing rate in each province before the reform; post94 is a dummy variable indicating whether it is after the 1994 tax separating reform. In robustness checks, we add additional provincial characteristics including number of state-level economic zones, per capita loans by financial institutions, and political ties between provincial and central leaders to control the business friendliness, financial development and political factors that might influence fiscal outcome.



Table 2.4: Extra Budgetary Category

Dependent variable	a. Basic specification		b. Robustness to controls		c. Falsification test	
	ln(per capita extra budgetary revenue)		ln(per capita extra budgetary revenue)		ln(per capita extra budgetary expenditure)	
	(1)	(2)	(3)	(4)	(5)	(6)
preshare*post94	0.448*** (0.075)	0.438*** (0.081)	0.445*** (0.076)	0.409*** (0.082)	0.474*** (0.077)	0.454*** (0.084)
post94		0.138 (0.148)		-0.154 (0.170)		-0.0287 (0.174)
trend		-0.062*** (0.011)		-0.080*** (0.014)		-0.071*** (0.014)
post94*trend		-0.026*** (0.007)		-0.006 (0.009)		-0.015 (0.009)
Ln(per capita GDP)	1.384*** (0.072)	1.357*** (0.074)	1.178*** (0.096)	1.258*** (0.095)	1.149*** (0.097)	1.228*** (0.097)
Economic zones			0.009* (0.005)	0.002 (0.005)	0.008* (0.005)	0.000 (0.005)
Ln(per capita loans)			0.168*** (0.048)	0.162*** (0.050)	0.147*** (0.049)	0.157*** (0.051)
political ties			0.018* (0.010)	-0.004 (0.011)	0.018* (0.010)	-0.002 (0.011)
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	-	Yes	-	Yes	-
Observations	705	705	676	676	673	673
R square	0.934	0.923	0.937	0.925	0.933	0.920

Notes: standard errors in parentheses \* p<0.10, \*\* p<0.05, \*\*\* p<0.01. Preshare denotes the average marginal sharing rate in each province before the reform; post94 is a dummy variable indicating whether it is after the 1994 tax separating reform. In robustness check, we add provincial characteristics including number of state-level economic zones, per capita loans by financial institutions, and political ties between provincial and central leaders to control the business friendliness, financial development and political factors that might affect the outcome. Dummies capturing 1993 and 1998 extra-budgetary national wide reforms are included.

## A Tax Revenue Assignments

Main Tax base	(1980-1983)	(1985-1987) and (1988-1993)	(1994-)
Central  fixed	Profits from centrally owned SOEs	Income and adjustment tax from centrally owned SOEs <sup>62</sup>	Income tax of all centrally owned SOEs
	Custom duties and income and commercial tax collected by customs	Custom duties and all 'VAT and product taxes' collected at customs	All customs duty, VAT and excise taxes on imports; Exercise/Consumption Tax <sup>63</sup>
Local  fixed	Profits from	Income and adjustment tax from locally owned SOEs	Income tax and adjustment tax of locally owned state enterprises, collectives, and private enterprises <sup>64</sup>
	locally owned SOEs	Income tax from collectively owned enterprises	Business tax falling on sectors not covered by VAT
Shared/adjustable	Industrial and commercial tax except those described above in central fixed revenue.	All sales taxes (VAT, business tax, and product tax) <sup>65</sup> revenues from all enterprises	Value-added tax (75 percent central, 25 percent provincial) <sup>66</sup>

Source: world bank1992, 2002; Wong1995

<sup>62</sup>'Tax for profit reform' was introduced in 1984, when the original profit remittance from SOEs was replaced by income and adjustment tax from SOEs.

<sup>63</sup>it's a new tax created in the 1994 tax separating reform.

<sup>64</sup>In 2002, this became a shared tax with a ratio of 50%: 50%. In 2003 and 2004, the ratio was changed to be 40% for the local governments

<sup>65</sup>In 1984, the original industrial and commercial tax was replaced by Product tax, VAT and business tax

<sup>66</sup>Product Tax was gradually abolished. VAT became the most important tax source, which accounted for about 60% of the total tax revenue

**B Sharing Rule between Central and Local Governments**

1. 1985-1987, in the table of tax, there are three categories (local, central and shared ones).

The sharing rule during 1985-1987 was: Province revenue =  $0 \times$  central fixed income +  $S \times$  (local fixed income<sup>67</sup> + adjustable income)

2. 1988-1993, Province revenue =  $0 \times$  central fixed income +  $S \times$  (local fixed income + shared income).
3. 1994-2004 Tax separating system: Province revenue =  $0 \times$  central exclusively tax +  $1 \times$  local exclusively tax +  $\sum S_i \times$  shared tax<sub>i</sub>

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<sup>67</sup>In China, local fixed income was, in principle, assigned fully to the local government. However, the actual practice of revenue sharing in China has not matched this scheme. Both "local fixed" and "shared" taxes have been subject to sharing, apparently because adherence to these categories caused a revenue shortfall to the central government.

## C Data Source and Processing Procedure

### Data Source

- Local budgetary tax indices:

1. TVAT (value added-tax)
2. TBT (business tax)
3. TEIT (enterprise income tax)

Tax revenue 1985-2004 is from China fiscal statistics 1950-1991, China fiscal yearbook 1992, 1993, 1994, China 55 years' statistics and provincial statistical yearbooks. The earliest comparable data on Tax is from 1985.

- Local extra-budgetary revenue index:

Extra-budgetary revenue 1980-2005 is from Qian (2005) and China 55 years' statistics.

- Local budgetary expenditure and extra-budgetary expenditure:

Expenditure series 1980-2005 is from Qian (2005) and China 55 years' statistics.

- local fiscal incentive indices:

1. MS (marginal sharing rate of VAT)
2. MSB (marginal sharing rate of Business Tax )
3. MSI (marginal sharing rate of enterprise income tax)

Data from 1980 to 1993 is from Qian (2005), World Bank (1992, 1999), Wong (1995).

- local economic control variables:

1. GDP, Gross Domestic Product
2. POP, population
3. Economic Zones (national level economic zones)
4. Loans of financial institutions
5. Political ties with the central government

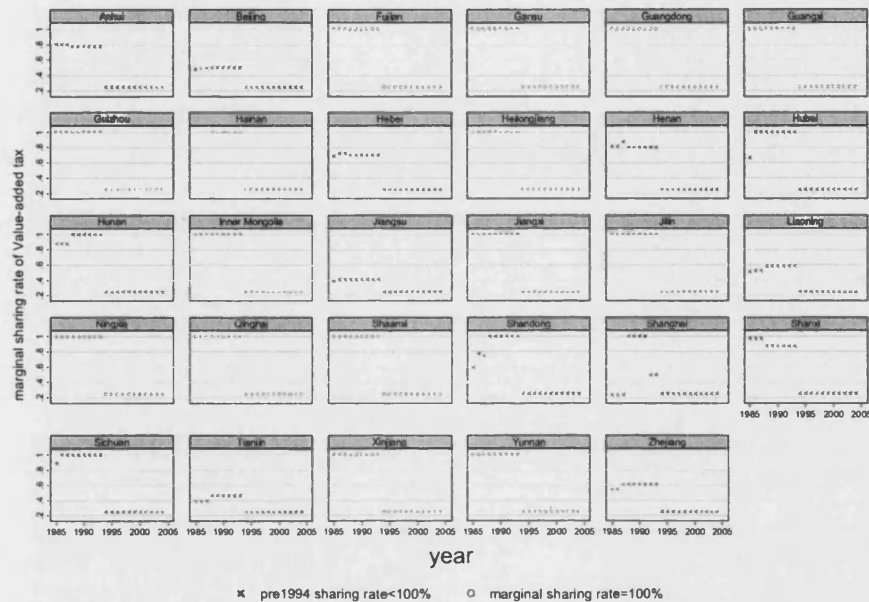
GDP, POP and Loans between 1985 and 2004 are from China statistical yearbooks and China 55 years statistics. Economic Zone indicator is from State Council of China; China's National Development and Reform Commission (2006). Political ties are from Shih, Victor (2004): Database on Provincial Factional Affiliation with Standing Committee Members of the Chinese Communist Party: 1978-2004.

### Data Processing Procedure

1. TVAT: total value added tax; before 1985, China implemented a major tax called ICT (industrial and commercial tax). From 1985 to 1993, ICT was replaced by three important specific taxes, i.e. value added tax, Product tax and business tax. Gradually, the tax base of product tax was replaced by value added tax. In 1994, product tax was abolished in all provinces and value added tax took over completely. For the data to be comparable with post 1994 value added tax, I summed up value added tax and product tax before 1994. Since 1994, the provincial statistics just take into account the 25% shared part of value added tax revenue. I divided the original statistics by 25% to get the total value added tax revenue generated in every province.
2. TEIT: total enterprise income tax; between 1985 and 1994, there were separate enterprise income tax categories, including state-owned enterprise income tax, state-owned enterprise adjustment tax, Income tax from collectively owned enterprises and income tax from private enterprises. After 1994, the above were replaced by a single tax category named enterprise income tax. I summed up the state-owned enterprise income tax, state-owned enterprise adjustment tax, Income tax from collectively owned enterprises and income tax from private enterprises before 1994 in order to be comparable with the post 1994 statistics. In 2002, the statistics just take into account the 50% shared part of local governments. From 2003 to 2004, the statistics take into account the 40% shared part of local governments. I divided the original statistics by the respective sharing rate to get comparable data.

## D Marginal Sharing Rates of Budgetary Taxes and Extra-budgetary Revenue

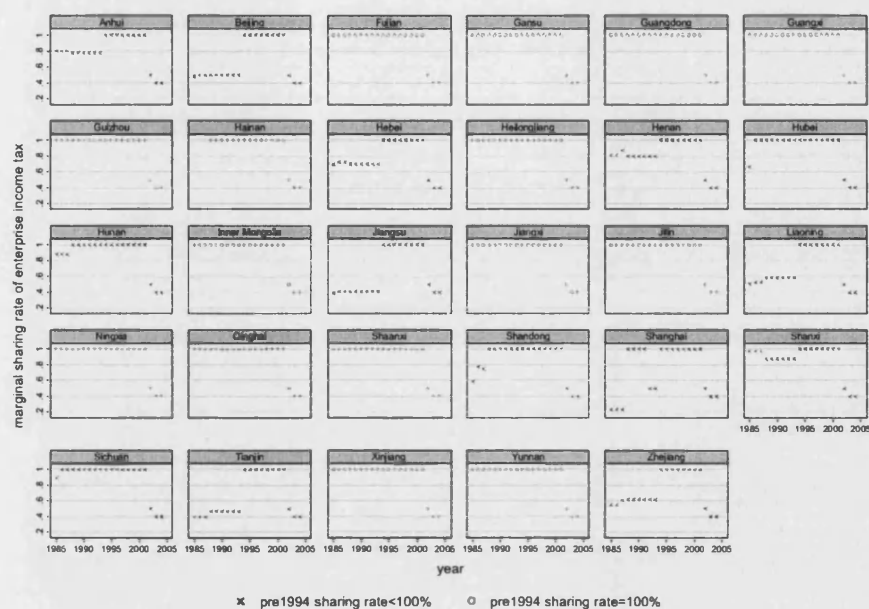
### Value Added Tax



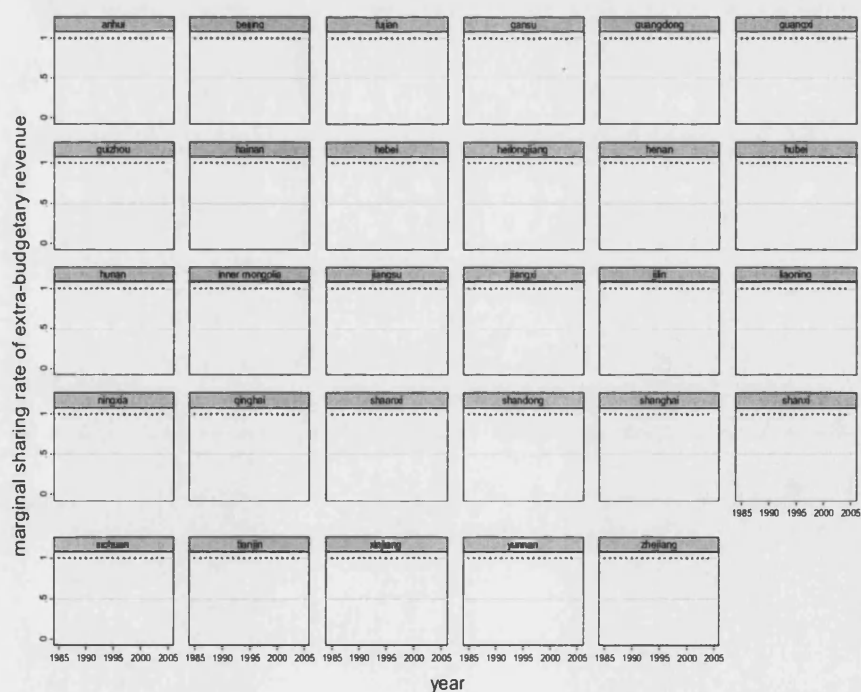
### Business Tax



## Enterprise Income Tax

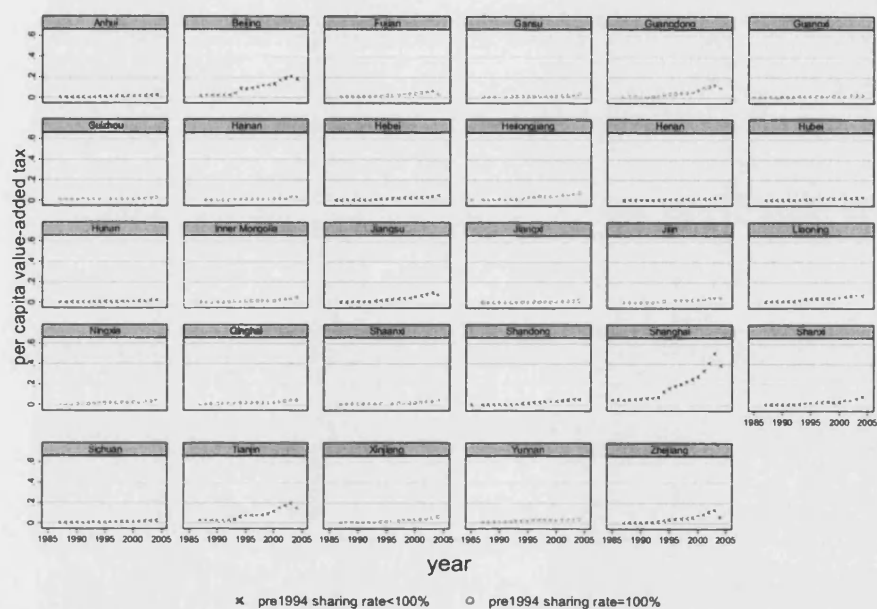


## Extra-budgetary Revenue

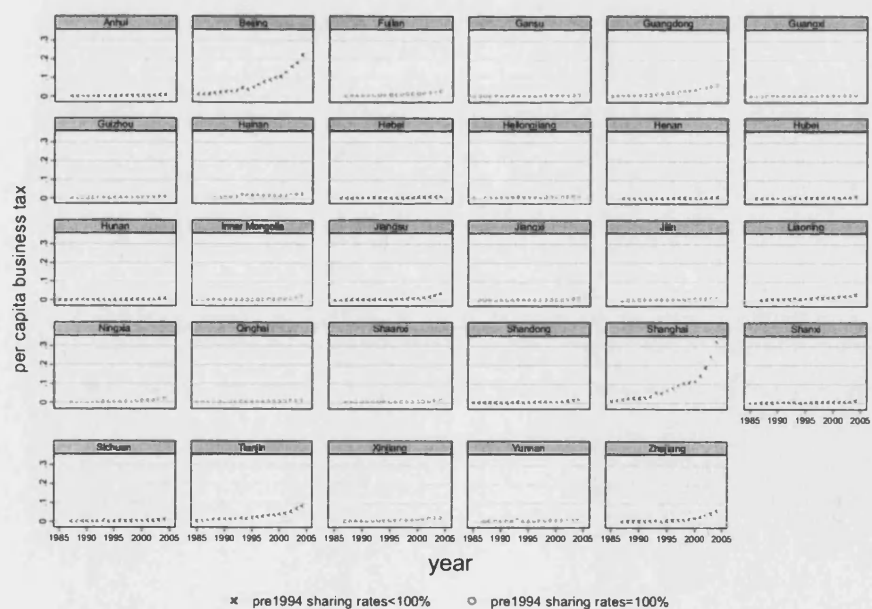


## E Budgetary and Extra-budgetary Revenue by Provinces

## Value Added tax

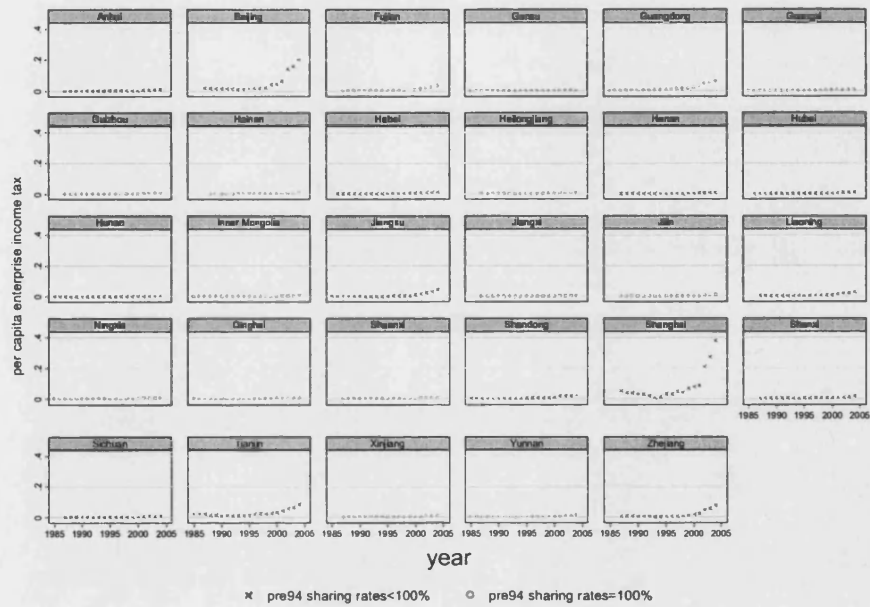


## Business Tax

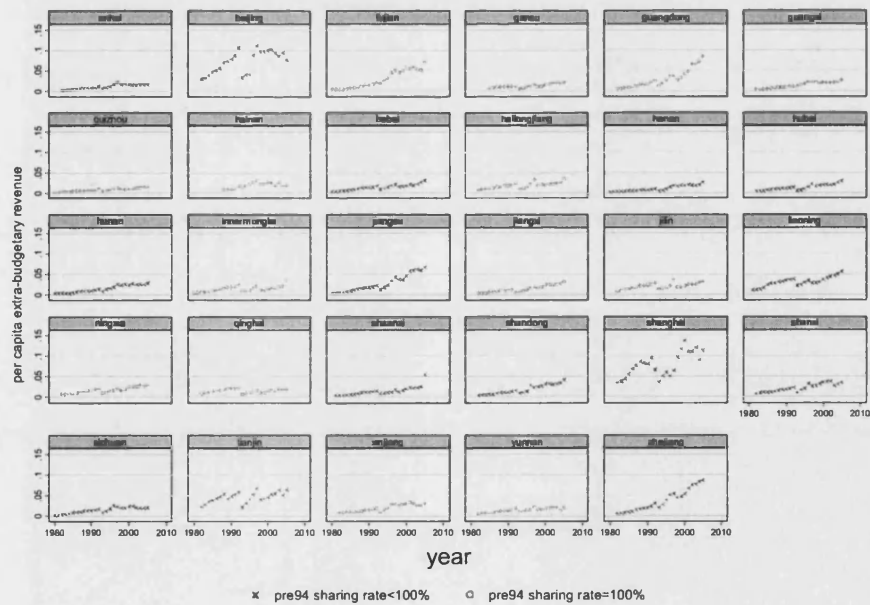




## Enterprise Income Tax



## Extra-budgetary Revenue



## 3 Fiscal Incentive and Municipal Real Estate Boom

### 3.1 Introduction

In Chapter 2, we evaluate the effect of the intergovernmental revenue sharing rate on provincial government's fiscal effort and shed light on how government agencies react to incentives under a multi-tasking framework. Despite the fact that various categories of fiscal revenue are used as the ultimate outcomes to capture fiscal effort, we cannot explore in detail what the exact channels of such efforts are due to data constraints. The change in fiscal revenue might come from the local governments' effort at better enforcement or through boosting the fiscal revenue base, and this chapter attempts to disentangle these channels.

This paper confines the focus to the governing authority at Chinese municipal level, which is below provincial government and so provides insight into the issues at a more micro level. In particular, we investigate how municipal governments react to the powerful fiscal incentive change, i.e. local fiscal sharing rate, in terms of their economic development strategy by exploiting an exogenous fiscal reform in 2002. In contrast to the previous chapter, we are able to explicitly point out the fiscal effort in the direction of the change in resource allocations controlled by local governments.

Chinese governance is characterized by a regionally decentralized authoritarian system (Xu, 2010) - a highly centralized political and personnel control at the national level, and a decentralized administrative and economic system at the local level<sup>68</sup>. Local governments were assigned the exclusive right over what is to become an increasingly important tax category, i.e. the business tax, which consists primarily of taxes levied upon the construction and real estate sector and also, to a lesser extent, other service sectors since 1994. Moreover, they were given official recognition for being the *de jure* owner of not merely the enterprises established under their jurisdiction, but also more importantly of land (the 15th National Congress of the Communist Party of China, 1997; Xu, 2010). In 2002, the central state of China attenuated the claims of local governments over important budgetary tax revenue, i.e. reduced the local governments' share in enterprise income tax by a substantial 50%, but left the local sharing rate of business tax and land sales<sup>69</sup> at 100%. We argue that the fiscal

<sup>68</sup>Xu (2010): "Personnel control is a major channel through which the central government controls, coordinates and motivates sub-national officials. With this instrument the Chinese regime implements a centrally-controlled decentralization, in which most tasks of reforms and economic development are carried out by sub-national governments. On the one hand regional officials control huge amounts of resources including land, credit and government owned firms and they enjoy fairly broad autonomies within their jurisdictions; on the other hand, their career paths are controlled by the central government. Specifically, appointments, promotions and demotions of sub-national officials in China are determined by the central government, and their career paths are tied to the performance of their jurisdictions. This makes Chinese economy fundamentally different from a federal system."

<sup>69</sup>Land sale is a big contributor to local extra-budgetary revenue.

intergovernmental relationship change made local governments choose to switch their development strategy to urbanization as articulated in the boom of the real estate sector in recent years to generate alternative fiscal revenue, i.e. business tax and land sale extra-budgetary revenue.

In order to guide empirical analysis, we first construct a model of multi-tasking agent in which local officials maximize the net fiscal profits they are allowed to keep within their jurisdictions through their controls over inputs including land and credit as well as through the preferences of higher officials who control their job retention and promotion. The model predicts that when incentives in terms of local sharing rate of an important local budgetary tax such as enterprise income tax decreases, local governments are expected to shift their controlled resources into sectors that are the main bases of other fiscal categories such as business tax and land sales on which they enjoy 100% sharing rate.

We test the above prediction using a unique and comprehensive dataset that covers 326 Chinese municipalities and provides information on investment in the real estate sector, real estate sales, real estate constructions, local budgetary revenue and land sales from the early 1990s to 2008. We exploit the fiscal regime change in 2002 that cut the local sharing rate of enterprise income tax to identify local governments' behavior change. The validity of our identification strategy lies in the fact that the big policy change is a common shock to all Chinese municipalities and was not captured by local interests, therefore should be regarded as exogenous in this context. We find that cutting the local sharing rate on enterprise income tax increases local governments' resources allocation including land and capital towards the real estate sector, where they are sole residual claimants of alternative fiscal categories (business tax revenue and land sale extra-budgetary revenue). Specifically, since 2002 the ratio of investments in the real estate sector has increased by 0.5 percentage points; the per capita sale area of the real estate sector has increased by 21%; the per capita constructed area driven by the real estate development has increased by 17%. More importantly, municipal per capita land sale revenue from converting agricultural land into commercial use has increased by 198% since 2002, which is consistent with the fact that the sale price of real estate has soared tremendously in recent years.

The results are further tested from four aspects: first, the effect of the 2002 fiscal reform on real estate development is not driven by some presumably richer region. Second, the enterprise income tax base measured as pre-tax profits shrunk after 2002, which support the hypothesis of substitution among fiscal categories. Third, one key problem of the identification source is that the 2002 reform-induced change in the fiscal sharing rate is common across all local jurisdictions in China. Hence, the reform creates only time variation in the fiscal sharing rate, there is no cross-sectional variation across different municipalities. Thus, our empirical strategy is basically a before-after comparison, controlling for a linear trend in the different outcome variables. There are concerns that the results seem to be driven by a long-run nonlinear (convex) trend in

the outcome variables, whereas we are allowing only for a linear trend. We therefore add a quadratic trend into the specifications and find weaker but still consistent results. Fourth, to go beyond the pure time variation, we extend our empirical exercise by comparing municipalities with different pre-existing shares of their revenue coming from the enterprise income tax. The effect of the 2002 fiscal reform is supposed to be bigger for the municipalities with a greater enterprise income tax share. As a result, we include an interaction term of the pre-2002 enterprise income tax share and reform dummy in the specification. A difference in difference approach is then used to identify the heterogeneous effect of the 2002 reform depending on the pre-existing enterprise income tax share. We find supporting evidence for land sales and real estate constructions that the effect of the 2002 fiscal reform is greater on municipalities with a larger pre-existing share of enterprise income tax.

The legal rights of land conversion with which local officials have been assigned and the fiscal incentive embedded in these rights have led to, on one hand, dramatically increased fiscal revenue from land sales and the real estate sector and on the other hand, worsening social conflicts between local governments and the general public including farmers whose lands were taken with very low compensation as well as residents who could not afford high price of housing in recent years (Guo, 2001; Li and O'Brien, 2008).

The policy implication of our findings is that decentralized economic and administrative power of local governments has to be matched with well-designed incentives to benefit the majority of population within the jurisdictions. In the Chinese case studied in this paper, the distorted fiscal incentive for local governments towards the real estate sector and agricultural land conversion indeed benefited certain interest groups (for example, real estate developers and local officials) at the expense of farmers and residents<sup>70</sup>.

Our paper contributes to the existing literature studying how the intergovernmental revenue sharing rate affects the government's behavior<sup>71</sup>. Our work may be distinguished from previous studies in three aspects. First, we use municipalities at a much more disaggregate level as the unit of observation, in contrast to those using

<sup>70</sup>In the empirical section, we will run tests on agricultural land conversion as well as real estate sales.

<sup>71</sup>In recent years there has been a growing literature discussing the role the structure of fiscal revenue sharing between upper-level governments and local governments plays in local business development including Zhuravskaya (2000), Lin and Liu (2000), Qian and Weingast (2005). However, the available evidence focuses on provincial governments and does not pertain to the issues at the local level. Also, the above work argued higher local stake in fiscal revenue motivated local governments to promote economic growth. It is very likely that the fiscal incentive captures the effect of other reform measures. Thus, the causal impact of fiscal incentive on local economic development is exposed to the endogeneity problem. Wang (2010) focused on how the 1994 tax separating reform impacted Chinese provincial governments' behavior, i.e. local governments' fiscal efforts in budgetary and extra-budgetary revenue corresponding to the fiscal sharing rate change; Kung etc (2009) argues that under a regional decentralized authoritarian regime, the change of fiscal incentive in 2002 makes local governments switch from industrialization to an urbanization process. However, the two papers are not able empirically to identify the exact channels that local governments participate in the regional economy.

provincial governments or countries. The unique dataset enables us to explore the impact of fiscal incentive on local government's behavior in more detail. Second, using an exogenous fiscal reform in 2002 that is common to all Chinese municipalities, we are able to identify the effect of incentive change more clearly with a potentially smaller threat of the endogeneity problem. Third, we embed the study of fiscal incentive within a regionally decentralized authoritarian system in the analytical framework of a multi-tasking agent model. This allows us explicitly to pin down the mechanisms by which local governments influence regional economy.

The next section introduces the institutional background of China's fiscal regime change and land use policy. Section 3.3 presents a theoretical model on local governments' objective function from which we derive testable hypotheses. Section 3.4 illustrates our data and identification strategy. Section 3.5 presents the results. Section 3.6 runs robustness checks. Section 3.7 concludes.

## 3.2 Background

The Chinese government consists of a region-based multi-level hierarchy. Below the central government there are four levels of sub-national governments: provincial level, municipal level, county level and township level (Appendix: Government Structure in China). A salient feature of the Chinese governance structure is the relatively hands-off approach taken by the national government with respect to most of the national economy. On the other hand, sub-national governments are deeply involved in the economies within their jurisdiction, including fiscal issues<sup>72</sup>, the allocation of land, regional firms and in the past exercising substantial controls over the allocation of bank credit (Gordon and Li, 2009). Meanwhile, their job retention and promotion are largely controlled by higher officials based on economic performance. Under this regional decentralized authoritarianism (Xu, 2010), the fiscal intergovernmental relationship combined with local governments' deep participation into the regional economies influence local governments' behavior and thus regional economic development.

### 3.2.1 Fiscal Regime

From the 1980s to 1993, local governments in China were offered a generous sharing rate on the fiscal revenue generated in their jurisdiction. As local governments got a significant amount of fiscal revenue via fiscal contracting, the central government lost its dominant control over the whole fiscal system. The state thus tightened fiscal

<sup>72</sup> Although by constitution China is not a federal state, in many important economic issues, Chinese sub-national governments are more powerful than their counterparts in federal countries around the world. Contrasting China's fiscal decentralization with its counterparts in the rest of the world during the early 2000s, the total expenditure of Chinese sub-national governments accounted for about 70% of the national total, which was far larger than that of the world's largest federal countries such as the U.S. (46%), Germany (40%) and Russia (38%) (Wong, 2006).

control in 1994 by redefining tax rights between the national and regional governments and took more in taxes from the localities<sup>73</sup>. While the central government has since the 1994 fiscal reform reclaimed a substantial share of the tax revenues, local governments were compensated by gaining other rights in the process. Specifically, they were assigned the exclusive right over what is to become an increasingly important tax category, the business tax. This consists primarily of taxes levied upon the construction and real estate sector and to a lesser extent also other service sectors. Moreover, local governments were given official recognition for being the *de jure* owner of not merely the enterprises established under their jurisdiction (local sharing rate being 100% for enterprise income tax), but more importantly also of land (the 15th National Congress of the Communist Party of China, 1997; Xu, 2010). By converting farmland for a variety of development projects (selling it to either real estate developers<sup>74</sup> or the so-called “urban development investment vehicles” that local governments themselves invest in), local governments are able both to collect fees associated with land conversion, and they are entitled to even more lucrative land conversion income<sup>75</sup>. This is an income stream over which it has been assigned exclusive rights by the central government commencing in 1994.

In 2002, similar in spirit to the 1994 reforms, the central government proposed to appropriate 50% of the enterprise income tax (increased to 60% in 2003). The main argument of the central government (Chinese State Council Document No. 37 (2001)) is that 100% sharing rate of enterprise income tax will enhance the influence of local governments on the firms within their jurisdictions and create barriers for further enterprise reform. High stakes in local enterprises might induce regional governments to obstruct fair competition<sup>76</sup>. However, the central state did not take a fraction of the business tax, nor land sale revenue. As displayed in Figure 3.1, after the regime change the importance of enterprise income tax in local budgetary revenue decreased

<sup>73</sup>In particular, central government classifies the fiscal revenue as central exclusive tax (local sharing rate 0%), local exclusive tax (local sharing rate 100%), and shared tax (local sharing rate between 0 and 100%). It wrestled from local governments the exclusive rights over a newly established consumption tax over such inelastic consumption products as beer, hard liquor and cigarettes, as well as reassigned a 75% of value-added tax to itself.

<sup>74</sup>Real estate developers purchase a tract of land, determine the marketing of the property, develop the building program and design, obtain the necessary public approval and financing, choose the builders to build the structure, and ultimately sell it. Developers work with many different counterparts along each step of this process, including architects, city planners, engineers, surveyors, inspectors, contractors, leasing agents and more.

<sup>75</sup>Although conversion of cultivated land for urban and rural construction can be dated to the late 1980s, thanks initially to the rural housing construction boom and subsequently to industrial, transport and urban developments, the magnitude of revenues was miniscule at that time. For instance, the amount of fees collected from land leasing totaled only 242 billion yuan nationwide between 1987 and 1994 (State Land Management Bureau, 1998, cited in Lin and Ho, 2005), which pales greatly in comparison with the 901 billion yuan or 90% of the entire revenue received during the three years between 2001 and 2003.

<sup>76</sup>Qian (1996): “Separation of government and enterprise has long been recognized by economists and government officials in China as a key to enterprise reform. Unless the issues of state ownership, government organization, and the role of the Party are addressed directly, separation of government and enterprise cannot materialize.”

from 13% before 2002 to 6% afterwards; the importance of business tax increases from 19% before 2002 to 23% afterwards.

### 3.2.2 Land Use Right

Arable land in China is *de jure* collectively-owned. In this system, the commune authorities represented the collectives before the reform, and the village authorities represented them afterwards. Although rights of use and income over land have been reassigned to the farm households since the land reform of the early 1980s, the farmers have no right to alter the land's usage, or to transfer it to another party. The crucial right to transfer these rights has remained in the hands of the state and, in part, of the village authorities. However, the collective owners have no right to convert arable land into non-arable usages. Nationalization has been the only legal mechanism by which farmland can be converted into non-arable usages since any non-arable usage of collective farmland requires a change from collective to state ownership (Articles 43 and 63 of the P.R.China's Land Management Law). Moreover, the law confines farmers' rights in land to basically an "agrarian" usage when land use is changed to non-agrarian and ownership converted (from collective to state). In other words, farmers would only be compensated according to the value of crop production after conversion, even though the land post-conversion may be far more valuable. Apart from the minimal compensation which is legally protected, China's farmers are subject to the whims of local authorities in the process of land conversion (Kung, Xu and Zhou, 2009).

## 3.3 A Theoretical Model

In this section we focus on how the available sources of revenue affect the incentives faced by Chinese officials. That there exists an intimate relationship between the performance of regional officials and their career prospects is already well documented in a number of studies<sup>77</sup>. Therefore, our set-up follows the structure of the Tiebout (1956) model in that the utility of officials depends on their net scale profits: tax revenue, plus income generated by land rents minus expenditures on public services.

**Set up:**

### 1. Agricultural sector

Farmers use capital  $K_f$ , labor  $L_f$ , land  $A_f$  as their inputs. The public goods provided by local governments  $G$  will also influence their productivity. Therefore, we assume that agricultural output  $Q_f = F(K_f, L_f, A_f; G)$ . Farmers have

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<sup>77</sup>Tsui and Wang (2004), for instance, show that 60% of the targets required of leading provincial officials are related to "economic construction". Moreover, the lower the level of regional governments the more concrete the stipulated targets become (Edin, 2003). Well performed municipal officials even transferred to other provinces as governors (Xu et al., 2007).

use rights to their land. However, given state-ownership of land, local governments are capable of converting the agricultural land  $A_f$  for commercial use. Compensation  $c$  will be paid to farmers for land conversion, which is equal to marginal product of labor employed in agriculture  $c = P_f F_{L_f}(K_f, L_f, A_f; G)$  (according to the P.R. China's Land Management Law in section 3.2.2).  $P_f$  is the price of agricultural output.  $F_{L_f}$  is the marginal output of labor employed in agriculture. Also, for simplicity, assume that an agricultural tax rate  $\sigma$  is levied on output  $Q_f$ .

## 2. Industrial and Service sectors

### Turnover tax- business tax:

The business tax rate levied on sector  $i$  is  $b_i$ ; the tax base is  $P_i Q_i(K_i, L_i, A_i; G)$ , where  $P_i$  is the price, output  $Q_i = F(K_i, L_i, A_i; G)$ ,  $K_i$  is capital,  $L_i$  denotes labor input,  $A_i$  denotes land input. The output also depends on the public goods provided by local governments  $G$ .

### Enterprise income tax:

The enterprise income tax rate of sector  $i$  is  $\tau_i$ ; tax base is firm profit  $\pi_i = P_i(1 - b_i)Q_i(K_i, L_i, A_i; G) - wL_i - rK_i - qA_i$ , where  $w$  is wage,  $r$  is interest rate,  $q$  is land rent paid by sector  $i$ .

## 3. Local governments:

Local governments get land sales revenue  $\sum_{i=1}^n qA_i$  by converting agricultural land for commercial use (commercial residential/commercial business buildings), where  $A_i$  denotes converted land used as inputs in sector  $i$ ,  $q$  is land rent paid. Local governments provide public goods to local residents at a level  $G$ , there is a minimum level  $\bar{G}$  that should be maintained in order to function the municipality properly. Therefore,  $G \geq \bar{G}$ .

## 4. Resource constraints:

Limited land stock:  $\sum_{i=1}^n A_i + A_f = A_T$ ;

for the moment, we assume that the supply of domestic capital is fixed as well, based on the deposits under the control of local banks, i.e.  $\sum_{i=1}^n K_i + K_f = K_T$ ;

limited labor supply due to the Hukou system<sup>78</sup>:  $\sum_{i=1}^n L_i + L_f = L_T$ .

<sup>78</sup>The Hukou system refers to the system of residency permits in China. With its large rural population of poor farm workers, Hukou limited mass migration from the land to the cities to ensure some structural stability.



The objective of officials is to maximize the sum of tax revenue from firms, agricultural taxes, and land sales revenue, minus compensation to farmers and minus the net cost (net of user fees) of public expenditures on local infrastructure.

$$\begin{aligned}
 \max_{K_i, A_i, G} & S_1 \left\{ \sum_{i=1}^n \tau_i \pi_i(K_i, L_i, A_i; G) \right\} + S_2 \left\{ \sum_{i=1}^n b_i P_i Q_i(K_i, L_i, A_i; G) \right\} + \underbrace{\sigma Q_f}_{\text{agricultural tax}} + S_3 \sum_{i=1}^n q A_i - c \sum_{i=1}^n A_i - G \\
 \text{st : } & \sum_{i=1}^n A_i + A_f = A_T; \\
 & \sum_{i=1}^n K_i + K_f = K_T; \\
 & \sum_{i=1}^n L_i + L_f = L_T; \\
 & G \geq \bar{G}.
 \end{aligned}$$

Given the local sharing rate of business tax revenue  $S_1$ , enterprise income tax revenue  $S_2$ , land sale revenue  $S_3$ , officials then allocate land  $A_i$  and capital  $K_i$  among different sectors and choose how much to spend on each form of public services  $G$  to maximize expression (1).

$$\begin{aligned}
 & \underbrace{S_1 \frac{\partial \tau_i \pi_i(K_i, L_i, A_i; G)}{\partial A_i} + S_2 \frac{\partial b_i P_i Q_i(K_i, L_i, A_i; G)}{\partial A_i} + \sigma \frac{\partial Q_f}{\partial A_i} + S_3 q - c - \frac{\partial c}{\partial A_i} A_i}_{\text{marginal benefit of allocating land into sector } i} = 0 \\
 & \underbrace{S_1 \frac{\partial \tau_i \pi_i(K_i, L_i, A_i; G)}{\partial K_i} + S_2 \frac{\partial b_i P_i Q_i(K_i, L_i, A_i; G)}{\partial K_i} + \sigma \frac{\partial Q_f}{\partial K_i} - \frac{\partial c}{\partial K_i} A_i}_{\text{marginal benefit of allocating capital into sector } i} = 0, \quad \forall i = 1, 2, \dots, n \\
 & S_1 \frac{\partial \left\{ \sum_{i=1}^n \tau_i \pi_i(K_i, L_i, A_i; G) \right\}}{\partial G} + S_2 \frac{\partial \left\{ \sum_{i=1}^n b_i P_i Q_i(K_i, L_i, A_i; G) \right\}}{\partial G} + \sigma \frac{\partial Q_f}{\partial G} - 1 = 0
 \end{aligned}$$

As suggested by the above expressions, optimal allocation of inputs controlled by local governments should be such that the marginal benefit of allocating inputs into each sector is equal.

**Proposition 1** *Subject to factor input constraints and public good provision responsibility, when the sharing rate on enterprise income tax  $S_1$  reduces significantly, local governments will turn to sector  $i$  which generates more business tax and land revenue, with local sharing rate  $S_2 = S_3 = 100\%$ . Equivalently,  $\frac{\partial K_i^*}{\partial S_1} < 0$ ;  $\frac{\partial A_i^*}{\partial S_1} < 0$ . Therefore, we should expect  $K_i$  and  $A_i$  to increase in sector  $i$  which is the main revenue base of business tax and land sales.*

Intuitive explanation behind the proposition is that when  $S_1$  reduces, the marginal benefit of allocating inputs in the related sector decreases. Local governments would reoptimize by shifting resources into other sectors with higher fiscal sharing rate, i.e. higher marginal benefit. In the case of China, construction and real estate sectors

are the main tax bases of business tax (over 40% in 2000s) and more importantly the major demanding side of land for commercial use.

Based on proposition 1, we should observe that since 2002, when local sharing rate of enterprise income tax was reduced to 50%, local governments needed to put more resources into the real estate sector and the construction sector and sell more land for revenue.

1. The investment in the real estate sector  $K_i$  increases;
2. The sales and constructions of the real estate sector  $Q_i(K_i, L_i, A_i; G)$  have increased since 2002;
3. The land sales revenue ( $qA_i$ ) by local governments from converting agricultural land into commercial use ( $A_i$ ) has increased since 2002; equivalently, land sales as a very important way to get extra-budgetary revenue increased.

### 3.4 Data and Empirical Strategy

#### 3.4.1 Data

In order to evaluate the impact of the 2002 fiscal reform on local governments' behavior change, we constructed a new panel dataset on 326 Chinese municipalities. The dataset tracks Chinese municipalities on real estate investment, total investment, real estate buildings sales, constructions as well as land sales. Table 3.1 displays descriptive statistics for the variables that we use in this paper. The Data Appendix contains more details on these variables.

#### 3.4.2 Empirical Strategy

The aim of the empirical exercise is to evaluate whether the 2002 fiscal reform led local governments to promote the real estate sector development and accelerate land sales. To do that, we exploited the fact that in 2002, the central government cut the local sharing rate of enterprise income tax to 50%. This is an exogenous policy shock to all municipalities that is not captured by local interests. The underlying assumption is that the evolution of the outcome variables such as real estate development and land sales should not change significantly in the absence of fiscal regime change. If the hypotheses from the previous section that local governments will switch their development strategy to boost sectors which are main sources of business tax and land sales are true, we should observe incremental effect since 2002. The approach we use is essentially a difference approach by comparing each municipality's post2002 evolution to its own pre-existing performance. Also, it is worth mentioning that there are no other reforms in 2002 that might contaminate the validity of our identification.

Figure 3.2 illustrates the basic idea behind the identification strategy without rigorous regressions. Since 2002, when the central government cut the local sharing rate

of enterprise income tax to 50% from 100%, per capita municipal sales and constructions related to the real estate sector have increased significantly, i.e. the slope of the real estate sales and constructions became steeper from 2002 onwards. The pattern we observe in Figure 3.2 (a, b) is consistent with the underlying fact that the construction and real estate (CRE) sectors have been a major contributing source of business tax revenue. The relative importance of CRE sectors to business tax had increased over time—from 30% in 2000 to almost 50%, in 2007<sup>79</sup>.

Figure 3.3 shows that after 2002 land sales soar dramatically. By converting agricultural land into commercial use, local governments benefit greatly in terms of fiscal revenue. In particular, the boom of the real estate sector benefits local governments in two ways. First, Figure 3.2 shows that it contributes to the budgetary revenue (i.e. business tax) of which local governments have 100% sharing rate, next, selling the land to developers generates even more sizable extra-budgetary revenue (land sale revenue) of which local governments are residual claimants. Indeed, as shown in Figure 3.4, the proportion of land sale revenue to local budgetary tax revenue increases from 6% in 1999 to 27% in 2002, and 40% in 2008.

### 3.4.3 Empirical Specification

To evaluate formally the effect of the 2002 fiscal reform on the real estate sector development and measures of land sales, we estimate the following specifications:

$$Y_{it} = \alpha_i + trend_t + \beta \times post2002_t + \varepsilon_{it} \quad (3.1)$$

$$Y_{it} = \alpha_i + mtrend_{it} + \lambda \times post2002_t + \varepsilon_{it} \quad (3.2)$$

$Y_{it}$  will be variables including investment, sales and constructions of the real estate sector, land sales area and revenue.  $post2002_t$  is a dummy capturing the 2002 fiscal reform which sets the local sharing rate of enterprise income tax to 50% from 100%,  $post2002_t = 1$  if year  $\geq 2002$ . In specification (3.1),  $\alpha_i$  is the municipality fixed effect, which captures municipal time-invariant factors that influence the outcome. For example, we expect the geographical location or natural endowment of the municipality to affect real estate development. Also, we control for time varying factors that might influence real estate development by adding a common trend into the regression. There are big concerns that municipalities are already on their own growing trends in the absence of the hypothetical impact from the 2002 fiscal reform. To address the issue, in specification (3.2), we use a more rigorous time control variable  $mtrend_{it}$  in the regression, which allows each municipality to have its own growing path. After controlling for the municipality specific trend, the effect of 2002 fiscal regime change on municipal outcomes - the coefficient of  $post2002_t$  will be identified by the deviation from its own trend, if there is any. The regressions all cluster the standard errors at the

<sup>79</sup>The ratios are calculated based on China tax yearbooks 2001 to 2008.

level of municipality to deal with potential problems of serial correlation (Bertrand, Duflo and Mullainathan (2004)). We do not put per capita GDP or urbanization as control variables into the regression as these indicators are highly endogenized with respect to real estate development. It is difficult to argue whether per capita GDP and urbanization lead to more real estate development or the other way round.

### 3.5 Results

Table 3.2 presents the effect of the 2002 fiscal reform on the investment, sale and constructions of the real estate sector. In the strongest specification which allows each municipality to have its own trend (equation (3.2)), we observe that since 2002, when the central government cut the local sharing rate of enterprise income tax from 100% to 50%, the ratio of real estate investment in total municipal investment increased by 0.5 percentage points, per capita sale area of the real estate sector increased by 21%, and per capita constructed area driven by real estate development increased by 17%.

Table 3.3 displays land sales (from converting agricultural land into commercial use) by municipal governments corresponding to the 2002 fiscal reform. Column (2) suggests that after taking into account each municipality's pre-existing growth path, per capita sale area of land increases by 22% since 2002. Column (4) suggests that municipal per capita land sale revenue increases by 198% from 2002 onwards, which implies that the sale price of the land soar greatly as well. The findings confirm that local governments switch their controlled resources to alternative fiscal categories with local sharing rate equal to 100% when they face a significant cut in one fiscal category.

### 3.6 Robustness Check

#### 3.6.1 Robustness Check by Regions

There are concerns that the municipalities in the east region drive the main results since they are more prosperous and we expect to observe more real estate development. If so, the positive correlation between the 2002 dummy that indicates the reduced local sharing rate of enterprise income tax and real estate related outcome observed in the full sample may be wrongly interpreted as capturing the general impact of the 2002 fiscal regime change. Therefore, we classify all municipalities into three groups. One is the west region, where municipalities are located geographically inland and are relatively less developed. The second group is the central region. The third group is the east region, which contains municipalities that are mostly coastal and richer<sup>80</sup>.

<sup>80</sup>China is officially divided into 3 regions in line with its natural and social resources endowments, historical development, and level of economic development. First, eastern China consists of 12 coastal provinces and municipalities, namely, Liaoning, Hebei, Tianjing, Beijing, Shandong, Jiangsu, Shanghai, Zhejiang, Fujian, Guangdong, Hainan and Guangxi. Second, middle China includes nine provinces and autonomous regions, namely, Heilongjiang, Jilin, Inner Mongolia (Neimenggu), Shanxi, Henan, Anhui, Hubei, Hunan and Jiangxi. Lastly, western China includes the rest of the 10 provinces and autonomous regions, Shaanxi, Gansu, Ningxia, Sichuan, Chongqing, Yunnan, Guizhou, Qinghai, Xinjiang and Tibet (Xizang). As the GDP per capita of Guangxi and Inner Mongolia are approxi-

We run the following regression.

$$Y_{it} = \alpha_i + mtrend_{it} + \lambda \times post2002_t + \sum_{R=1}^2 \delta_R (R \times post2002_t) + \varepsilon_{it} \quad (3.3)$$

where  $R$  are two dummy variables capturing if the municipality belongs to the west or central region. The coefficient of  $post2002_t$ ,  $\lambda$ , corresponds to the effect of the 2002 fiscal reform on municipalities in the east region, which is the base group in the regression. The coefficients of two interactions,  $\delta_R$ , illustrate the impact of the 2002 fiscal reform on the west region and central region relative to the base group (the east region). In Column (1) of Table 3.4, regarding the ratio of real estate investment in total investment, the reform has a heterogeneous effect on the municipalities among three regions. There is no significant effect on the municipalities within the east region. However, for municipalities in the central region, the ratio of real estate investment increases by 0.8 percentage points after 2002. For those in the west region, the magnitude is even bigger, suggesting an increase of 1.9 percentage points. West and central regions increase more in terms of their real estate investment relative to the east region as they start from a lower level<sup>81</sup>. In Column (2), the estimates suggest that there is a strong effect of the 2002 fiscal reform on the real estate sale. The per capita sale area of real estate increases by 17%, which is a general effect to the municipalities belonging to all three regions. In Columns (3) and (4), there are no significant differences across three regions regarding the effect of cutting local budgetary sharing rate on real estate constructions and sale revenue. In Column (5), municipal per capita land sale area increases by 50% after the 2002 fiscal regime change for those in the east region, 17% for those in the central region and 7% for those in the west region. It suggests that the east region, which is relatively richer and presumably has better infrastructures supplies more land for sale after 2002 relative to other regions. In Column (6), we observe municipalities within three regions to have a similar increase in per capita land sale revenue by 207% after 2002. The seemingly puzzling pattern of Columns (5) and (6) is driven by the fact that west and central regions are catching up in terms of their land price from a much lower pre-existing level<sup>82</sup>. Therefore, though their area of converted land does not increase as much as those in the east region, the incremental effect of the 2002 reform on their land sale revenue is equally sizable relative to the latter. Table 3.4 provides us with

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mately equivalent to the average level of the GDP per capita of the western 10 provinces and regions, the central government decided in 2001 that Guangxi and Inner Mongolia can also have access to the preferential policy previously given to the aforementioned 10 provinces and regions, which implies that Guangxi and Inner Mongolia are also regarded as western provinces. In this paper, we put Guangxi and Inner Mongolia into the Western China group.

<sup>81</sup>It should be noted that the identification strategy in this paper is essentially a difference approach which compares each municipality's post 2002 outcome to its own pre-existing level.

<sup>82</sup>Using the same specification as equation (3.3), we find that land price in the municipalities of the central region increases by 77% since 2002; land price in those of the west region rises by 68% since 2002. Land price in those of the east region increases by 25% from 2002 onwards.

confidence that the findings from the baseline are not limited to some particularly richer municipalities. The 2002 reform has significant effects on municipalities within west and central regions as well. Changing local governments' sharing rate in one fiscal category will indeed influence their behavior in terms of economic strategies which help boost substitutable fiscal revenue bases.

### 3.6.2 Robustness Check: Quadratic Trend

A big concern about our identification source is that the 2002 reform-induced change in the fiscal sharing rate is common across all local jurisdictions in China. Hence, the reform creates only time variation in the fiscal sharing rate. There is no cross-sectional variation across different municipalities. The empirical strategy is essentially a before-after comparison, controlling for a linear trend in the different outcome variables. Looking at the Figures 3.3 and 3.4, the results seem to be driven by a long-run nonlinear (convex) trend in the outcome variables, whereas we are allowing only for a linear trend. Therefore, a quadratic trend is added into the specifications to deal with the concern.

$$Y_{it} = \alpha_i + mtrend_{it} + mtrend_{it}^2 + \lambda \times post2002_t + \varepsilon_{it} \quad (3.4)$$

As Table 3.5 shows, significant results still hold for land sales and real estate constructions, though the magnitude reduced significantly. For other indicators of the real estate development including the real estate investment and real estate sales, the coefficients become insignificant, which suggests that allowing richer time-trend controls has weakened our results. To certain extent, it reveals the underlying disadvantage of using a simple difference approach as our identification strategy.

### 3.6.3 Robustness Check: Enterprise Income Tax Base

In section 3.5, we claim that local governments respond to the reduced sharing rate of enterprise income tax by shifting resources into the real estate sector for alternative fiscal revenue. As a result, the revenue base of enterprise income tax should instead shrink after 2002. Despite the fact that municipal statistics on pre-tax industrial enterprise profits are only available from 1998 to 2006 for 282 municipalities<sup>83</sup>, we test the impact of the 2002 fiscal reform on the indicator to provide supporting evidence. The specification is the same as section 3.4.3.

In Column (1) of Table 3.6, we find that since 2002 the revenue base of enterprise income tax has decreased by 21% after we control for the common national trend. In Column (2), which is the strongest specification that allows each municipality to have its own trend, we still find a similar effect. The enterprise income tax base has exhibited a reduction of 19%. The results of Table 3.6 confirm the existence of a

<sup>83</sup>Datasource: China city statistical yearbooks 1999 to 2007.

substitution effect between different fiscal categories.

### 3.7 Extension

In this section, we go beyond the pure time variation by comparing municipalities with different shares of their revenue coming from the enterprise income tax, which is a much more compelling source of identifying variation. We might think that the effect of the 2002 fiscal reform would be greater for the municipalities with a greater share of their revenue coming from the enterprise income tax. Therefore, we add an interaction term  $preEITshare_i \times post2002_t$  into the empirical specification (Equation 3.5), which enables us to use a difference in difference approach to identify the different effect of the 2002 reform depending on the pre-existing enterprise income tax share. The coefficients of the newly added term is expected to be positive, if there is any heterogeneous effect.

$$Y_{it} = \alpha_i + mtrend_{it} + \lambda_1 \times (preEITshare_i \times post2002_t) + \lambda_2 \times post2002_t + \varepsilon_{it} \quad (3.5)$$

As table 3.7 shows, the 2002 fiscal reform had similar effect on the municipal real estate development, which is captured by the insignificant coefficients of the interaction term from column (1) to (4). The coefficients of  $post2002_t$  are positive and significant, suggesting that the reduced local enterprise income tax sharing rate in 2002 leads to an average positive effect on municipal real estate development. However, regarding land sales, the coefficient of the interaction term,  $preEITshare_i \times post2002_t$ , is positive and significant, which indicates that the effect is significantly larger for municipalities with a greater share coming from enterprise income tax.

### 3.8 Conclusion

This paper examines how Chinese municipal governments react to the powerful fiscal incentive in terms of their economic development strategy. Guided by the analytical framework from a multi-tasking agent model, we test the impact of the exogenous fiscal regime change in 2002 that greatly reduced local sharing rate of enterprise income tax on local governments. We find supporting evidence that the change in fiscal intergovernmental relationship induces local governments to adjust their behavior.

Compared to previous studies on government incentives, this paper tries to explore the role of local governments in economic development using the data at a more disaggregated level as well as a clean identification strategy. In particular, it shows that municipal governments respond to reduced local sharing rate of enterprise income tax by allocating more resources, especially land, from agriculture into the real estate sector. Switching their development focus to urbanization as articulated in the recent real estate boom, local governments benefit greatly from fiscal categories including business tax revenue and land sale extra-budgetary revenue. However, the

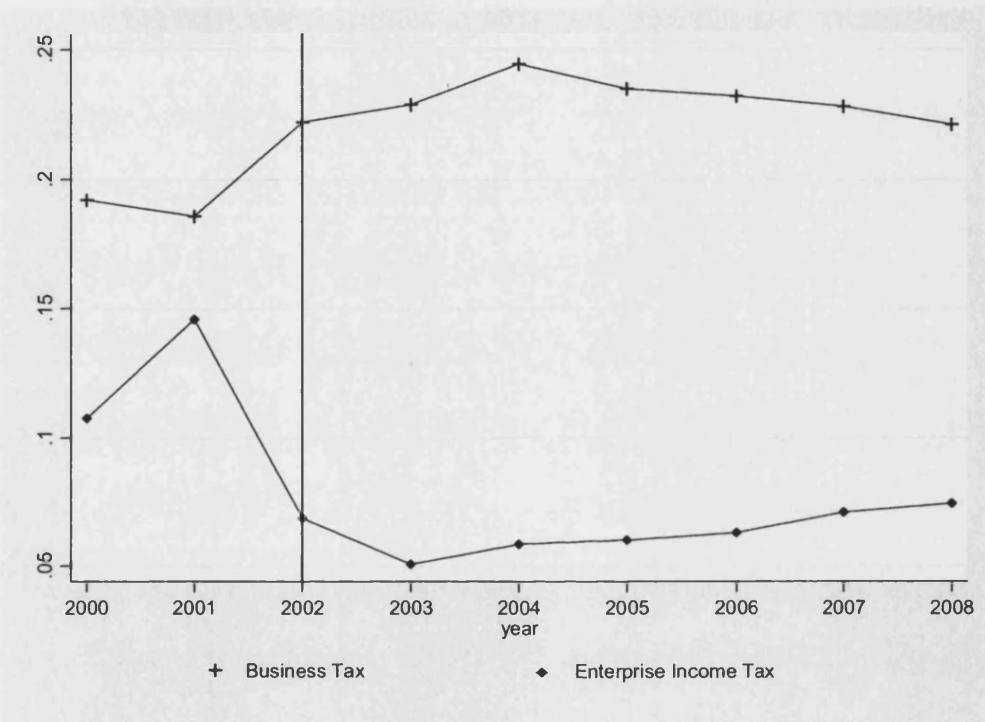
huge amount of land conversion and escalating real estate price cause worsening social conflicts between local governments and the general public including farmers whose lands were taken with low compensation and residents who are unable to afford the housing price.

The findings suggest that regional decentralized economic power should be matched with well-designed incentives for local governments and property right protection for disadvantaged groups such as farmers. After all, the aim of decentralization is not just about motivating local governments to promote overall GDP growth or fiscal revenue, but essentially about making local governance more responsive to local needs and bringing the utmost benefits to the large majority of the local population.



### 3.9 Figures and tables

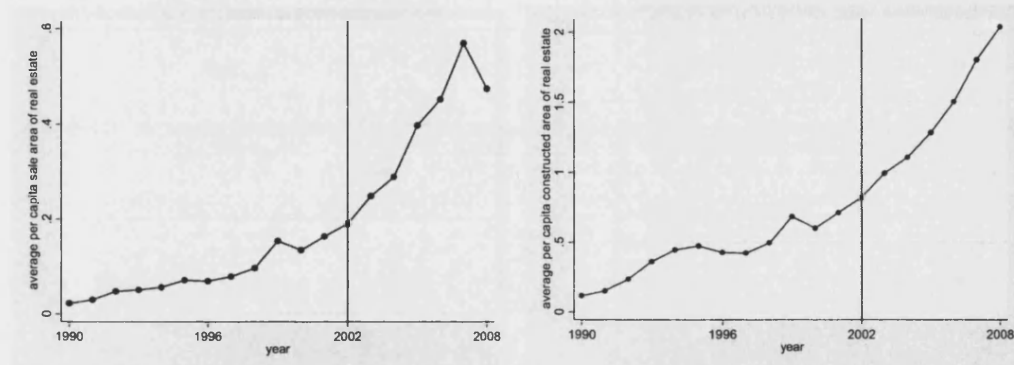
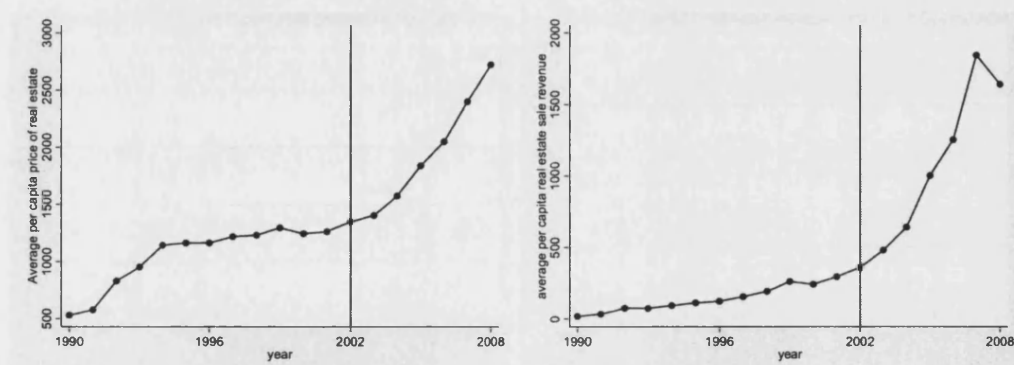
**Figure 3.1:** Ratio of Business Tax and Enterprise Income Tax in Local Budgetary Revenue



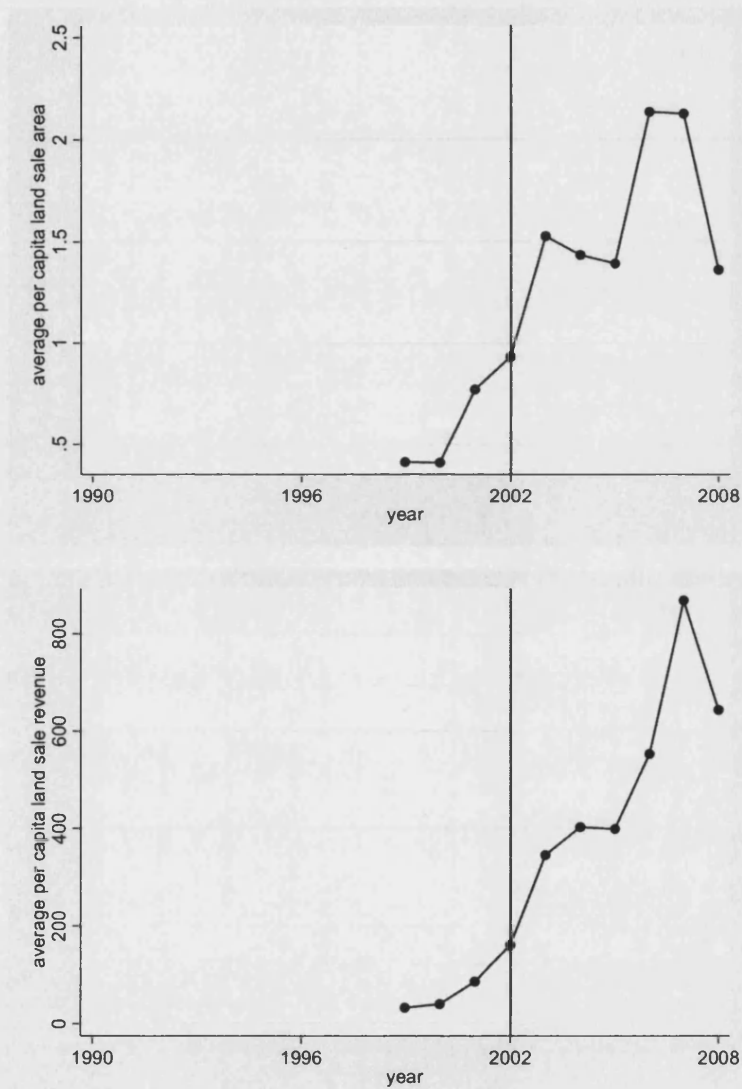
Note: Ratios of enterprise income tax and business tax in local budgetary revenue are calculated based on municipal fiscal revenue statistics. Figure 3.1 describes the average ratio of 326 Chinese municipalities. As displayed in the plot, the importance of enterprise income tax in local budgetary revenue decreased from 13% before 2002 to 6%; the importance of business tax increases from 19% before 2002 to 23% afterwards.

**Figure 3.2: Real Estate Sale and Contruction**

(Unit: Square Meter)

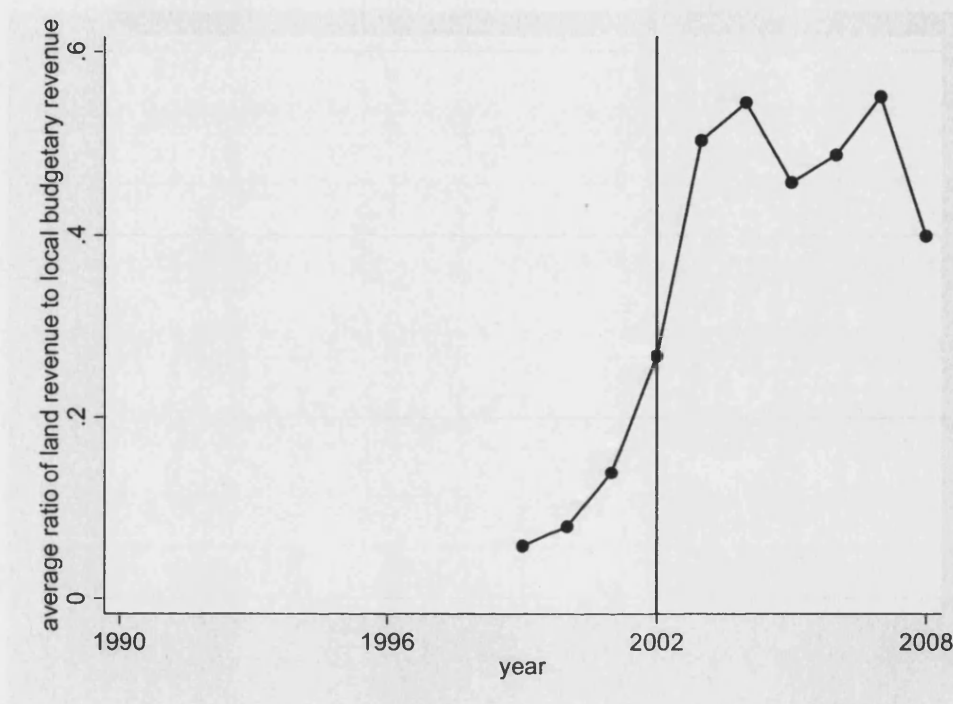
**b Real Estate Price and Taxable Real Estate Sale Revenue (Unit: RMB)**

Note: Since 2002, when the central government cut local sharing rate of enterprise income tax to 50% from 100%, municipal per capita sales and constructions related to the real estate sector increased significantly.

**Figure 3.3:** Per capita Land Sales Area and Revenue

Since 2002, local governments greatly increased the conversion of farmland into commercial use. By selling the land to developers, they on one hand benefit from the budgetary category (The construction and real estate sector as the main tax base of business tax) and on the other hand get huge extra-budgetary revenue (land sale revenue) on which they are the holy residual claimant.

**Figure 3.4:** Ratio of Land Sale Extra-budgetary Revenue to Local Budgetary Revenue



Note: land sales revenue as a very important component of extra-budgetary revenue, increases dramatically from 6% in 1999 to 27% in 2002, and 40% in 2008 relative to local budgetary revenue after 2002, when the central government cut local budgetary sharing rate of enterprise income tax from 100% to 50%.

**Table 3.1:** Summary Statistics of Main Variables

Variables	Number of Obs	Mean	Standard Error	Min	Max
Ratio of real estate investment in total investment	8722	0.06	0.08	0	0.82
Per capita real estate sale area(square meter)	5766	0.2	0.3	0	9.2
Per capita real estate construction area (square meter)	4625	0.7	1.4	0	28.2
Per capita real estate sale revenue (RMB)	5475	485	1406	0	24551
Per capita local budgetary revenue (RMB)	8972	377	811	-32	24983
Per capita land sale area (Hectare)	3195	1.25	2.18	0	41.68
Per capita land sale revenue (RMB)	3195	476	7204	0	405040

Notes: Beginning and end year is 1990 and 2008 for real estate investment, sale and constructions. Land sale area and revenue cover years from 1999 to 2008. Data sources and construction are described in full in Data Appendix.

Table 3.2: Investment, Sale and Construction of the Real Estate Sector

	(1)		(2)		(3)		(4)	
Dependent Variable	Ratio of real estate in total investment		Ln( per capita sale area of real estate)		Ln(per capita constructed area of real estate)		Ln( per capita sale revenue of real estate)	
Post2002	0.004 (0.003)	0.005* (0.003)	0.294*** (0.045)	0.188*** (0.038)	0.419*** (0.097)	0.154*** (0.059)	0.140*** (0.042)	0.043 (0.040)
Municipality fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
National trend	Yes	-	Yes	-	Yes	-	Yes	-
Municipal trend	-	Yes	-	Yes	-	Yes	-	Yes
Number of observations	8722	8722	4322	4322	3506	3506	4178	4178
R square	0.622	0.768	0.834	0.889	0.846	0.916	0.889	0.929

Notes: Standard errors are clustered at municipality level and reported in parentheses.\* p<0.10, \*\* p<0.05, \*\*\* p<0.01. Post2002 is a dummy indicating the 2002 fiscal change, i.e. the central government cut local sharing rate of enterprise income tax from 100% to 50%.

**Table 3.3:** Per capita Land Sale by Local Governments

	(1)		(2)	
Dependent Variable	Ln( Per capita sale area of land)		Ln(Per capita land sale revenue)	
Post2002	0.208*** (0.023)	0.200*** (0.025)	1.110*** (0.055)	1.093*** (0.059)
Municipality fixed effect	Yes	Yes	Yes	Yes
National trend	Yes	-	Yes	-
Municipality trend	-	Yes	-	Yes
Number of observations	3185	3185	3185	3185
R square	0.642	0.689	0.836	0.867
Notes: Standard errors are clustered at municipality level and reported in parentheses.* p<0.10, ** p<0.05, *** p<0.01. Post2002 is a dummy indicating the 2002 fiscal change, i.e. the central government cut local sharing rate of enterprise income tax from 100% to 50%.				

Table 3.4: Robustness Check by Regions

Dependent Variable	Ratio of real estate in total investment	Ln( per capita sale area of real estate)	Ln(per capita constructed area of real estate)	Ln( per capita sale revenue of real estate)	Ln( per capita sale area of land)	Ln(per capita land sale revenue)
Post2002	-0.01 (0.007)	0.159*** (0.048)	0.028 (0.058)	0.016 (0.058)	0.403*** (0.051)	1.123*** (0.106)
Central Region*Post2002	0.018** (0.009)	-0.028 (0.081)	0.188 (0.126)	-0.010 (0.087)	-0.247*** (0.060)	0.166 (0.142)
West Region*Post2002	0.029*** (0.008)	0.130 (0.094)	0.271 (0.166)	0.100 (0.103)	-0.339*** (0.061)	-0.230 (0.146)
Municipality fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Municipality trend	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	8722	4322	3506	4178	3185	3185
R square	0.769	0.889	0.929	0.926	0.695	0.868

Notes: Standard errors are clustered at municipality level and reported in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Post2002 is a dummy indicating the 2002 fiscal change, i.e. the central government cut local sharing rate of enterprise income tax from 100% to 50%. China is officially divided into 3 regions in line with its natural and social resources endowments, historical development, and level of economic development. First, Eastern Region consists of 101 municipalities under 11 coastal provinces, namely, Liaoning, Hebei, Tianjing, Beijing, Shandong, Jiangsu, Shanghai, Zhejiang, Fujian, Guangdong and Hainan. Second, Central Region includes 108 municipalities under eight provinces and autonomous regions, namely, Heilongjiang, Jilin, Shanxi, Henan, Anhui, Hubei, Hunan and Jiangxi. Lastly, Western China includes 121 municipalities under the remaining 12 provinces and autonomous regions, Shaanxi, Gansu, Guangxi, Inner Mongolia, Ningxia, Sichuan, Chongqing, Yunnan, Guizhou, Qinghai, Xinjiang and Tibet.



Table 3.5: Robustness Check: Quadratic Trend

Dependent Variable	Ratio of real estate in total investment	Ln( per capita sale area of real estate)	Ln(per capita constructed area of real estate)	Ln( per capita sale revenue of real estate)	Ln( per capita sale area of land)	Ln(per capita land sale revenue)
Post2002	-0.006* (0.003)	0.059 (0.036)	0.090** (0.041)	-0.044 (0.042)	0.076** (0.030)	0.592*** (0.072)
Municipality fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Municipality trend	Yes	Yes	Yes	Yes	Yes	Yes
Municipal quadratic trend	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	8722	4322	3506	4178	3185	3185
R square	0.799	0.911	0.934	0.939	0.689	0.867

Notes: Standard errors are clustered at municipality level and reported in parentheses.\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Post2002 is a dummy indicating the 2002 fiscal change, i.e. the central government cut local sharing rate of enterprise income tax from 100% to 50%. Compared to the baseline specification, the municipal quadratic trend is added to deal with the concern that there is an ongoing convex trend that was wrongly captured as the effect of the 2002 fiscal reform.

Table 3.6: Robustness Check: Revenue Base of Enterprise Income Tax

Dependent Variable	Ln(Revenue base of enterprise income tax)	
Post2002	-0.191*** (0.024)	-0.178*** (0.024)
Municipality fixed effect	Yes	Yes
National trend	Yes	-
Municipal trend	-	Yes
Number of observations	2398	2398
R square	0.836	0.861
Notes: Standard errors are clustered at municipality level and reported in parentheses.* p<0.10, ** p<0.05, *** p<0.01. Post2002 is a dummy indicating the 2002 fiscal change, i.e. the central government cut local sharing rate of enterprise income tax from 100% to 50%. In the case when a municipality has negative pre-tax profits, we treat the enterprise income tax base=0; otherwise, the pre-tax profits of enterprises will be the exact enterprise income tax base.		

Table 3.7: Extension: A Difference-in-Difference Approach

Dependent Variable	Ratio of real estate in total investment	Ln( per capita sale area of real estate)	Ln(per capita constructed area of real estate)	Ln( per capita sale revenue of real estate)	Ln( per capita sale area of land)	Ln(per capita land sale revenue)
PreEITshare*Post2002	-0.042 (0.036)	-0.471 (0.381)	-0.739 (0.608)	-0.145 (0.396)	1.675*** (0.350)	1.165* (0.622)
Post2002	0.011** (0.006)	0.259*** (0.075)	0.267** (0.128)	0.071 (0.080)	-0.044 (0.049)	0.909*** (0.110)
Municipality fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Municipality trend	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	8545	4290	3479	4148	3156	3156
R square	0.766	0.890	0.917	0.927	0.700	0.866

Notes: Standard errors are clustered at municipality level and reported in parentheses.\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Post2002 is a dummy indicating the 2002 fiscal change, i.e. the central government cut local sharing rate of enterprise income tax from 100% to 50%. Compared to the baseline specification, we explore a difference in difference approach by adding an interaction term, PreEITshare\*Post2002, where PreEITshare is the municipality's share of enterprise income tax in local budgetary revenue pre-2002. The coefficient of the interaction term captures the different effect of the 2002 fiscal reform depending on the pre-existing share of enterprise income tax in local budgetary revenue, if there is any.

## A Data Appendix

This appendix provides information on the variables used in this paper.

### Sample of Municipalities:

The dataset includes 326 municipalities of 31 provinces in China. We combine Fuyang and Bozhou in Anhui Province to be one municipality, and Baicheng and Songyuan to be one municipality due to statistical availability. We omit Laibin and Chongzuo of Guangxi Province since they were only established in early 2000s. Due to statistical availability, we treat Tibet as a big municipality.

### Main Variables and Statistical Source:

#### 1. Total Investment and Real estate investment:

China city statistical yearbooks (1996-2008); 60th anniversary of People's Republic of China (1949-2009) statistical yearbooks; 30th anniversary of opening up Reform statistical books 1978-2008.

#### 2. Real estate sale and constructions:

China regional statistical yearbooks (2000-2009); Province statistical yearbooks (1990s, 2000s).

#### 3. Local Budgetary Revenue:

60th anniversary of People's Republic of China (1949-2009) statistical yearbooks;  
30th anniversary of opening up Reform statistical books 1978-2008.

#### 4. Business Tax Revenue:

China regional statistical yearbooks (2001-2009).

#### 5. Enterprise Income Tax Revenue:

China regional statistical yearbooks (2001-2009).

#### 6. Land Sales Area and Revenue:

China land statistical yearbooks (2000-2009).

#### 7. Pre-tax Profits of Industrial Enterprises

China city statistical yearbooks (1999-2007).

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